VOL. 5 NO. 20
October 31, 1980

Energy Research Abstracts

ABSTRACTS 31452-33170

Technical Information Center
UNITED STATES DEPARTMENT OF ENERGY

CURRENT AWARENESS PUBLICATIONS ON ENERGY

To provide complete coverage of literature related to major Department programs, announcement publications are regularly issued which are comprehensive in their coverage of certain energy fields. All information in these publications, plus additional backup information, is included in the energy data base of the Technical Information Center; all references are also available for machine searching via the on-line retrieval system, DOE/RECON. Descriptions of these current awareness publications, which are supported either directly or indirectly by the DOE, appear below.

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Coal Abstracts (Published in cooperation with the Technical Information Center by the International Energy Agency, IEA Coal Research, London, England)

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Vol. 5, No. 20
ISSN: 0160-3604
CODEN: ERABDZ
Oct. 31, 1980

ENERGY RESEARCH ABSTRACTS

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Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs originated by the U. S. Department of Energy, its laboratories, energy centers, and contractors. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations. The user should remain aware that *ERA* coverage of non-report literature is limited to that generated by Department of Energy activity.

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•ABSTRACTS IN *ENERGY RESEARCH ABSTRACTS*

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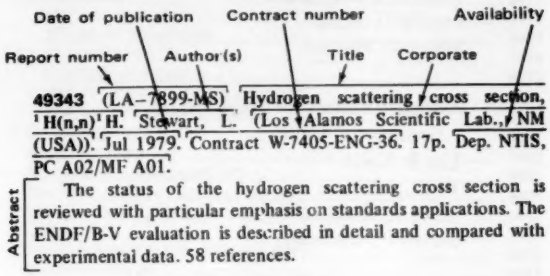
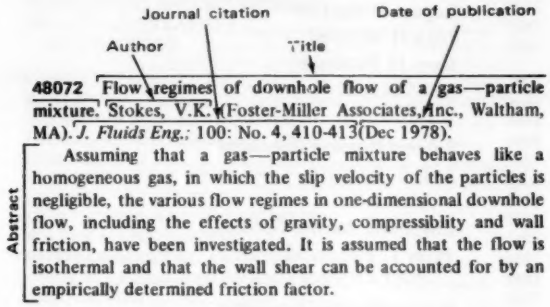

Date of publication
Contract number
Availability
Report number
Author(s)
Title
Corporate
49343 (LA–7899-MS) Hydrogen scattering cross section, ¹H(n,n)¹H. Stewart, L. (Los Alamos Scientific Lab., NM (USA)). Jul 1979. Contract W-7405-ENG-36. 17p. Dep. NTIS, PC A02/MF A01.
Abstract
The status of the hydrogen scattering cross section is reviewed with particular emphasis on standards applications. The ENDF/B-V evaluation is described in detail and compared with experimental data. 58 references.


Journal citation
Date of publication
Author
Title
48072 Flow regimes of downhole flow of a gas—particle mixture. Stokes, V.K. (Foster-Miller Associates, Inc., Waltham, MA). J. Fluids Eng.; 100: No. 4, 410-413 (Dec 1978).
Abstract
Assuming that a gas—particle mixture behaves like a homogeneous gas, in which the slip velocity of the particles is negligible, the various flow regimes in one-dimensional downhole flow, including the effects of gravity, compressiblity and wall friction, have been investigated. It is assumed that the flow is isothermal and that the wall shear can be accounted for by an empirically determined friction factor.

•INDEXES TO *ENERGY RESEARCH ABSTRACTS*

Five indexes are provided for approaching the contents of each issue of *Energy Research Abstracts (ERA)*. These indexes are cumulated semiannually and annually. Each index is preceded by an introduction that details the organization of the index and the principles by which it was compiled. The reader is referred to these introductions for information not found in the index examples that follow.

•Corporate Index

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

49343 (LA–7899-MS) Hydrogen scattering cross section, ¹H(n,n)¹H. Stewart, L. (Los Alamos Scientific Lab., NM (USA)). Jul 1979. Contract W-7405-ENG-36. 17p. Dep. NTIS, PC A02/MF A01.

is indexed as:

Los Alamos Scientific Lab., NM (USA)
Advanced laser fusion target fabrication research and development proposal, 4:48249 (LA–7619-P)
Hydrogen scattering cross section, ¹H(n,n)¹H, 4:49343 (LA–7899-MS)

•Author Index

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

Stewart, L., Hydrogen scattering cross section, ¹H(n,n)¹H, 4:49343 (LA–7899-MS)
Stewart, M.D., *See* McInroy, J.F., 4:49280
Stewart, W., *See* Dean, J.W., 4:48543
Stimson, J., Reproduction, growth, and survival of Enewetak corals, 4:49200 (NVO–0703-1, pp 56-59)

•Subject Index

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles, informative phrases, or both specific to these entries are arranged alphabetically under the entries.

HYDROGEN 1 TARGET/NEUTRON REACTIONS
Hydrogen scattering cross section, ¹H(n,n)¹H (Above 100 keV, review), 4:49343 (LA–7899-MS)
HYDROGEN NITRATES
See NITRIC ACID
HYDROLOGY/RESEARCH PROGRAMS
Inventory of advanced energy technologies and energy conservation research and development: 1976-1978. Volume II. Prepared for the Committee on Science and Technology, U.S. House of Representatives, Ninety-Sixth Congress, 4:48749

•Contract Number Index

DOE technical report literature is indexed using contract numbers. This index contains the contract number with corresponding abstract and report numbers.

W-7405-ENG-36	**Los Alamos Scientific Lab., NM (USA)**	
	3:49698	LA-tr–78-45
	3:49857	LA–7224T
	3:49863	LA–7235-MS
W-7405-ENG-48	**California Univ., Livermore (USA). Lawrence Livermore Lab.**	
	3:49386	UCRL–52456
	3:49431	UCRL–52405

•Report Number Index

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. While not reports, patents and conference papers are indexed here as a matter of convenience.

LA-		
7899-MS	**4:49343**	**Dep. NTIS, PC A02/MF A01**
LA-tr-		
78-69	**4:48158**	**Dep. NTIS, PC A03/MF A01**

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ENERGY RESEARCH ABSTRACTS

COAL AND COAL PRODUCTS

31452 (DOE/EIA—0008/1(79)) **Quarterly report. First quarter 1979.** (Department of Energy, Washington, DC (USA). Energy Information Administration). Jul 1979. 61p. NTIS, PC A04/MF A01.

Domestic production of energy during the first quarter of 1979 was 5.1% less than in the fourth quarter of 1978, but 12.7% more than the first quarter of 1978, which was affected by the coal strike. Domestic consumption of energy during the first quarter of 1979 was 8.6% more than in the fourth quarter of 1978 and 2.6% more than the first quarter of 1978. New imports of energy during the first quarter of 1979 were 1.0 less than in the fourth quarter of 1978 and 2.7% less than in the first quarter of 1978. Specific data on coal, natural gas, and petroleum are discussed and tabulated. Production of electricity by utilities during the first quarter of 1979 was 6.3% higher than for the comparable 1978 period.

PROCESSING

REFER ALSO TO CITATION(S) 31530

31453 (PB—296-708) **Background material for the workshop on health and environmental effects of coal gasification and liquefaction technologies.** Antizzo, J. (Mitre Corp., McLean, VA (USA). METREK Div.). May 1979. Contract AC01-79EV10018. 275p. (DOE/HEW/EPA—01; M—78-58). NTIS, PC A12/MF A01.

The purpose of this document is to provide background material for participants in the Interagency Workshop on the Health and Environmental Effects of Coal Gasification and Liquefaction technologies. The workshop is jointly sponsored by the Department of Energy, the Department of Health, Education and Welfare and the Environmental Protection Agency. The document is an edited compilation of information designed to provide a broad view of three major coal conversion technologies: coal liquefaction, coal gasification, and in situ gasification. The document is organized to provide several different cuts of information, depending upon the needs of individual users. It consists of five major sections and four Appendices containing supporting material.

DESULFURIZATION AND PURIFICATION

REFER ALSO TO CITATION(S) 31546, 32191, 32192

31454 (IS-T—905) **Rate of oxydesulfurization of coal-derived pyrite in hot alkaline solution.** Sun, Y. (Ames Lab., IA (USA)). Aug 1980. Contract W-7405-ENG-82. 134p. NTIS, PC A07/MF A01. Thesis.

The rate of oxydesulfurization of coal-derived pyrite with hot dilute sodium carbonate solutions in a fixed bed tubular reactor was investigated. Pyrite used in this study was obtained in the form of nodules from the refuse produced in cleaning coal. The major areas studied included the difference in leaching characteristics of acid cleaned pyrite and uncleaned pyrite, the degree of sulfur removal from pyrite at different locations in the tubular reactor, the effect on sulfur conversion of the gas to liquid volume ratio in the reactor, and the effect of various operating conditions including temperature (100 to 175°C), oxygen partial pressure (3.13 to 13.33 atm.), average particle size (114 to 332 μm.), and reaction time. With the fixed bed tubular reactor, acid cleaned pyrites gave more consistent results than uncleaned pyrites. The degree of sulfur extraction decreased from the point where the leaching solution entered the reactor to where it left and this change appeared to be related to the drop in oxygen partial pressure across the bed. Also, the gas to liquid volume ratio in the reactor affected the sulfur conversion, and at 125°C and 13.33 atm. oxygen pressure the optimum ratio was found to be about 0.17. Furthermore, the rate of sulfur extraction increased significantly with increasing temperature, increasing oxygen partial pressure, and decreasing particle size. The shrinking unreacted core model was used to analyze the leaching process. The results showed that diffusion through a hematite shell which forms around a shrinking core of unreacted pyrite controls the overall rate of extraction of sulfur from the pyrite particles.

HYDROGENATION

REFER ALSO TO CITATION(S) 31473, 31482

31455 (BMFT-FB-T—80-034) **Fundamental research at catalysts for the hydrogenation of carbon monoxide.** Ritschel, M. (Bonn Univ. (Germany, F.R.). Inst. fuer Physikalische Chemie). Jul 1980. 138p. (In German). NTIS (US Sales Only), PC A07/MF A01.

The catalytic hydrogenation of carbon monoxide (Fischer-Tropsch synthesis) on iron catalysts is presently applied only in the Republic of South Africa to produce aliphatics (alkanes, alkenes, and alcohols, ketones, organic acids, etc.). To use this method of coal liquefaction economically in Western Europe or in the USA, it is necessary to modify the synthesis, e.g., in such a way that predominantly gaseous olefins (ethylene, propylene, butylene) are formed. For the development of such a process, iron catalysts have been studied under uhv and more practical conditions. New information about the possibility of influencing the reaction has been obtained. On the basis of polycrystalline iron-whiskers, catalysts with high olefin selectivity and remarkably long life could be developed. Supplementary investigations of the ad- and desorption of (CO, H_2, FT-products) and the catalytic decomposition of ethyl alcohol led to a new formulation of the FT-reaction mechanism.

31456 (BMFT-FB-T—80-035) **New heterogeneous catalysts for coal hydrogenation.** Weis, A. (Muenchen Univ. (Germany, F.R.). Inst. fuer Anorganische Chemie). Jul 1980. 87p. (In German). NTIS (US Sales Only), PC A05/MF A01.

In the first part of the present study we investigated the possibilty for improving hydrogenation of coal by a pretreatment with compounds, which react to intercalation complexes with graphite. The increased surface area, accessible after this pretreatment, has a drastic effect, which, however, is overcompensated by the large amount of chemicals, needed in the procedure. In the second part layered disulfides, capable of forming intercalation complexes have been tested as catalysts for coal hydrogenation. Several of these render coal (Ruhr II) pyridine-soluble up to 85 to 87%, when applied in amounts of 0.07% only at 380°C and a hydrogen pressure of 10 bars. Layered sulfides are most effective, in case they can be disintegrated into colloidal solutions with individual MS_2-layers via intercalcalation. Among these, sulfides in the systems $(Mo,Cr)S_2$, $(Ti,Sn)S_2$, Na/sub x/$(Co,Nb)S_2$, Na/sub x/$(Ni,Nb)S_2$, Na/sub x/$(Co,Cu,Nb)S_2$, $(Ti,Mo)S_2$, Na/sub x/$(Co,V)S_2$, and (H_2O)/sub x/CrS_2 are most effective. Deviation from ideal stoichiometry is very important.

31457 **Enhanced reactivity of metal-impregnated peat char and semicoke during gas phase hydrogenolysis.** Tarki, H.T.; Kiennemann, A.; Chornet, E. (Universite de Sherbrooke, Quebec). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 277-285(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

In the present study, the gas phase hydrogenolysis of peat chars prepared at about 540°C and previously impregnated with Fe, Ni and Co has been investigated. The following points summarize

the main findings: devolatilization of the char is an important factor for its subsequent reactivity toward hydrogen. The lower the devolatization temperature prior to hydrogenolysis, the higher the rate of methane formation during hydrogenolysis. The catalytic effect of the metals is important at two levels: higher conversions to methane and lower temperatures of maximum rate of methane formation. The conversion versus time profiles can be very well fitted by the following expression df/dt = kf/sup a/ (1-f)/sup b/ suggesting a kinetic sequence closely related to autocatalytic steps. The oxygenated surface species play a major role in the methane formation, which probably takes place at the lower temperatures (625 to 700°C) via reaction between surface CO and chemisorbed hydrogen catalyzed by the metals. Co is the most active of the metals at this level. At higher temperatures (much greater than 700°C), direct reaction of hydrogen with the surface carbon atoms also seems to occur.

GASIFICATION

REFER ALSO TO CITATION(S) 31486, 31492, 31513, 31531, 31532, 31533, 31534, 31537, 31717, 32430, 32870

31458 (CONF-790432—(Vol.1), pp 121-128) **Underground coal gasification at Tennessee Colony.** Garrard, C.W. Jr. (Basic Resources, Inc., Dallas, TX). 1979.

From Conference on industrial energy conservation technology and exhibition; Houston, TX, USA (22 Apr 1979).

The Tennessee Colony In Situ Coal Gasification Project conducted by Basic Resources Inc. is the most recent step in Texas Utilities Company's ongoing research into the utilization of Texas lignite. The project, an application of the Soviet technology which was acquired under a license agreement in 1975, is a continuation of the field-testing program to examine the feasibility of in-situ lignite gasification in Texas which began with a 27-day test burn at a site near Fairfield in August of 1976. The objectives of the Tennessee Colony Project, are to examine the economic, technological, and environmental aspects of a commercial project. The Project, which began in August of 1978, utilizes air as the oxidizing agent and is comprised of two channels of gasification operating simultaneously. The test is presently still in progress and producing gas with a heat content in the range of 80 to 100 Btu.

31459 (CONF-800610—9) **Preparation of a coal conversion systems technical data book.** Talwalkar, A.T.; Bodle, W.W.; Almaula, B. (Institute of Gas Technology, Chicago, IL (USA)). 1980. Contract AC01-76ET10251. 21p. NTIS, PC A02/MF A01.

From American Institute of Chemical Engineering conference; Philadelphia, PA, USA (8 Jun 1980).

The purpose of the Data Book is to compile, evaluate and correlate data in the fields of coal conversion and utilization (except for direct combustion) generated under various DOE projects or otherwise available. These prepared data are to be presented in forms useful to engineers and scientists engaged in developments within the emerging coal conversion and utilization industry. The Data Book is being prepared in a loose-leaf form that can be updated at regular intervals. This is not a research project but rather a critical review and evaluation of existing information, correlations, and design techniques as well as compilation of necessary data. This continuing project also brings into focus areas where needed technical data are lacking. In the preparation of this Data Book, IGT and DOE are making every effort to obtain inputs from potential users and to this end have the benefit of a volunteer industrial consultant group to review the Data Book program, progress, and priorities.

31460 (DOE/ET/10188—T1) **Coal gasification: Duluth campus heating plant. Grate support system failure.** (Minnesota Univ., Minneapolis (USA)). 1980. Contract AB01-77ET10188. 20p. NTIS, PC A02/MF A01.

During the seventh run there was a complete failure of the grate support system. Two massive holes and numerous cracks finished the deterioration of the grate holder that had started on the fifth run of the gasification system. The zero ductile casting was quenched with ash water during an emergency loss of blast air with the resulting depressurization of the producer. The cause of the failure was threefold - quenching of the hot cast iron, low ductility in the material used (Meehanite W-1), and high stresses set up in the casting at bolting locations. To correct this problem the grate support system has undergone the following design changes: (1) The structural part of the grate holder will be a plate steel weldment welded directly (instead of bolting) to the ash pan. This will eliminate gasket leaks, give us a more ductile material for transporting the stress from the grate to the rotating ash pan, and give us better thermal conduction of heat (elimination of gasket thermal break) from the grate holder to water in the ash pan. (2) The grinding lobes will be cast iron wearing attachments bolted to the structural steel grate holder. The attachments will be made of a more ductile iron than Meehanite W-1. In the future, when the grinding lobes wear, they can be replaced without removing the entire grate holder.

31461 (DOE/ET/10254—T3) **Test and evaluate the TRI-GAS low-Btu coal gasification process. Quarterly report, April-June 1980.** (Bituminous Coal Research, Inc., Monroeville, PA (USA)). Jul 1980. Contract AC01-78ET10254. 17p. NTIS, PC A02/MF A01.

Four tests were conducted in the TRI-GAS PEDU. Test No. 3S-55 was prematurely shut down because of failure of the steam boiler. Steay-state operation was not achieved. Following repairs to the steam boiler Test No. 3S-56 was conducted. This test was also terminated prematurely, due to failure of the power controller for the steam boiler. Repairs were again made. In Test No. 3S-57, bed temperatures in Stages 2 and 3 were lower than required for gasification, although some reaction occurred at the top of the reactors where the temperatures exceeded 1600 F. The test was concluded somewhat prematurely due to plugging of the coal-feed line. PEDU Test No. 3S-58, an integrated three-stage test, was conducted in June. The heating value of the product gas was about 100 Btu per cu ft even though failure of the reactor heaters prevented the Stage 2 temperature from exceeding 1550 F.

31462 (DOE/ET/13511—T1) **Survey of welding processes for field fabrication of 2 1/4 Cr-1 Mo steel pressure vessels.** Grotke, G.E. (Westinghouse Research and Development Center, Pittsburgh, PA (USA)). Apr 1980. Contract AC01-78ET13511. 106p. NTIS, PC A06/MF A01.

Any evaluation of fabrication methods for massive pressure vessels must consider several welding processes with potential for heavy-section applications. These include submerged-arc and shielded metal-arc, narrow-joint modifications of inert-gas metal-arc and inert-gas tungsten-arc processes, electroslag, and electron beam. The advantage and disadvantages of each are discussed. Electroslag welding can be dropped from consideration for joining of 2 1/4 Cr-1 Mo steel because welds made with this method do not provide the required mechanical properties in the welded and stress relieved condition. The extension of electron-beam welding to sections as thick as 4 or 8 inches (100 or 200 mm) is too recent a development to permit full evaluation. The manual shielded metal-arc and submerged-arc welding processes have both been employed, often together, for field fabrication of large vessels. They have the historical advantage of successful application but present other disadvantages that make them otherwise less attractive. The manual shielded metal-arc process can be used for all-position welding. It is however, a slow and expensive technique for joining heavy sections, requires large amounts of skilled labor that is in critically short supply, and introduces a high incidence of weld repairs. Automatic submerged-arc welding has been employed in many critical applications and for welding in the flat position is free of most of the criticism that can be leveled at the shielded metal-arc process. Specialized techniques have been developed for horizontal and vertical position welding but, used in this manner, the applications are limited and the cost advantage of the process is lost.

31463 (DOE/ET/13511—T2) **Development of automated welding process for field fabrication of thick walled pressure vessels. Technical progress report, second quarter, FY 1980, ending March 28, 1980.** Schneider, U.A. (Westinghouse Electric Corp., Tampa, FL (USA). Tampa Div.). 1980. Contract AC01-78ET13511. 72p. NTIS, PC A04/MF A01.

Progress on a metallurgical contract is reported: (1) specifications of 2 1/4 chromium-1 molybdenum low alloy steel plate for a coal gasification project; (2) methods of welding and analyses of helium-argon mixtures for welding; and (3) tensile properties of welded joints. (LTN)

31464 (DOE/METC/SP—80/1) **Valve technology development at the Morgantown Energy Technology Center.** (TRW Energy Systems Group, Morgantown, WV (USA)). Nov 1979. Contract AM21-78MC08496. 87p. NTIS, PC A05/MF A01.

The Energy Technology Center located at Morgantown, West Virginia (METC) is responsible for fluidized bed combustion, hot gas cleanup and flue gas desulfurization, coal gasification, and coal feeding systems. Valves are inherent in all these activities and the Process Technology and Integration Branch has responsibility for coal conversion valve technology development at METC. During development of second and third generation coal conversion and utilization processes, a recurrent problem was manifested - valve failures. The valve failures are typically caused by erosion, jamming, or other solids handling related problems and have resulted in redundant loops to allow on-stream valve maintenance and replacement, process redesign to locate valves in a less severe environment, use of sacrificial valves, and other means to try to eliminate valving. Most of these techniques are expensive, inconvenient, and detrimental to the process. The proposed solution is to: define requirements for valve service that encompass the most promising coal conversion processes; obtain input from valve users; survey the valve industry to determine the availability of valves to satisfy the requirements; test available valves to ensure their adequacy; and develop new valves for applications where existing valves are inadequate. The Morgantown Energy Technology Center has initiated implementa-

tion of this solution in their valve technology development program, which is described in this report.

31465 (DOE/TIC—11229) **Solar coal gasification research. Progress report, April 1-June 30, 1980.** (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 8p. NTIS, PC A02/MF A01.

This program is a continuation of a research effort that was started in FY 79 and funded through the Office of Energy Research. During the first year a technique for simulation of concentrated sunlight using a cw CO_2 laser was developed, and parametric studies of the gasification and pyrolysis of static samples of finely ground coal were carried out. The results of these studies and a description of the apparatus and diagnostics used are covered in a recent publication. Our current program is designed to extend the results of the previous work to entrained flow pyrolysis and gasification. In this process the finely ground coal is entrained in a reactant gas and passed through a zone of high radiant flux. The radiant energy from the sun or from the CO_2 laser drives the endothermic processes of pyrolysis and gasification. The entrained coal gasification process was chosen for its intrinsic scalability, ease of control, low thermal inertia, and capability of utilizing both caking and noncaking coals. Completion of the laboratory tests with the entrained flow gasification technique will permit straight-forward scaling of this concept to existing solar furnaces. During the past quarter we have concentrated on completing the static coal tests and on the design, construction, and testing of apparatus needed for the entrained coal tests.

31466 (EPRI-AP—1429) **Texaco-based gasification-combined-cycle system performance studies. Final report.** Oliva, J.J.; Shemo, S.D. (General Electric Co., Schenectady, NY (USA)). Jun 1980. 167p. NTIS, PC A08/MF A01.

This report presents the results of an investigation of the effects on system thermal efficiency of major design variables and configuration options in combined cycle power plants based on air or oxygen-blown Texaco gasifiers. The plants are sized to process 10,000 tons per day of Illinois No. 6 coal. Design parameters considered were: steam cycle steam conditions; gasification system pressure, oxidant temperature and composition; coal/water slurry ratio and temperature; ambient temperature; and fuel temperature. Configuration options considered were: the quantity of raw gas cooler by-pass flow; recirculation of cold gas to temper the raw gas product before entering the raw gas cooler; clean gas resaturation; use of a clean gas expander; plant size; use of steam turbines or electric motors for oxygen plant compressors; supplementary firing of the heat recovery steam generator. The system performance estimates and sensitivity studies have been conducted for integrated gasification-combined cycle systems. Cycles using combustion turbines firing at 1985°F (present technology), 2100°F (next generation) and 2600°F and 3000°F (advanced are presented. Based on 1978 New Source Performance Standards, it is concluded that present technology combustion turbines and steam cycle components; the Texaco gasifier/raw gas cooler/ and present technology gas cleanup components can be configured into either integrated or non-integrated power plants which are competitive with present day large coal-fired steam plants which utilize present technology for control of SO_2, NO/sub x/, fly ash, and emissions to water and land. More stringent environmental control standards that now exist or might exist in the future, together with advances in combustion turbines, gasifiers, and raw gas cleanup technology will enhance this competitiveness.

31467 (FE—1784-60) **Program to discover materials suitable for service under hostile conditions obtaining in equipment for the gasification of coal and other solid fuels. Annual progress report, January 1, 1979-December 31, 1979.** Schaefer, A.O. (ed.). (Metal Properties Council, Inc., New York (USA)). 7 Jul 1980. Contract AC01-76ET10670. 459p. NTIS, PC A20/MF A01.

This annual report describes in general the progress during calendar 1979, on a program under the direction of The Metal Properties Council, Inc., designed to screen materials for use in such plants with respect to the various unique corrosive environments obtaining therein; and, finally, to provide useful corrosion data as well as reliable information on other properties needed for the design, construction and operation of such plants. This program is sponsored in part by the US Department of Energy and in part by the Gas Research Institute. The program is being pursued in seven phases. The actual laboratory testing for the first four phases is being conducted at the IIT Research Institute. The testing necessary for phase V is being conducted principally at the Southwest Research Institute. The entire program is being monitored by Subcommittee 9 on Materials for the Gasification of Coal of The Metal Properties Council, Inc. A summary of achievements during calendar 1979 under each phase is given.

31468 (FE—1784-63) **Program to discover materials suitable for service under hostile conditions obtaining in equipment for the gasification of coal and other solid fuels. Quarterly progress report, January 1, 1980-March 31, 1980.** Schaefer, A.O. (ed.). (Metal Properties Council, Inc., New York (USA)). 19 Aug 1980. Contract AC01-76ET10670. 153p. NTIS, PC A08/MF A01.

This report describes in general the progress on a program under the direction of The Metal Properties Council, Inc., designed to screen materials for use in such plants with respect to the various unique corrosive environments obtaining therein; and, finally, to provide useful corrosion data as well as reliable information on other properties needed for the design, construction and operation of such plants. Previous reports have indicated that this program was pursued in seven phases. Phase VII was concerned with materials for use in processes for the liquefaction of coals, whereas Phases I through VI were all concerned with gasification processes. Phase VII is now covered by a separate contract (No. DE-AC01-79ET13546). It will henceforth be reported separately, and this report will cover six phases only. A summary of achievements during the first quarter of calendar 1980 is given.

31469 (FE—2247-25) **Gasification of residual materials from coal liquefaction. Evaluation of pelletized Kerr McGee Ash Concentrate as a feedstock for the Texaco Coal Gasification Process. Final report on Type I laboratory test.** Robin, A.M. (Texaco, Inc., Montebello, CA (USA). Montebello Research Lab.). May 1980. Contract AC01-76ET10137. 13p. NTIS, PC A02/MF A01.

A Type I Laboratory Evaluation of a sample of pelletized Kerr McGee Ash Concentrate from Kentucky No. 9 coal was completed at Texaco's Montebello Research Laboratory. This material is a suitable feedstock for the Texaco Coal Gasification Process. It may be fed to the gasifier as a water slurry with a solids concentration greater than 60 (wt) percent. At 1200 psig, 1500 pounds per hour of ash concentrate are estimated to yield about 44,000 standard cubic feet per hour of hydrogen plus carbon monoxide.

31470 (FE—2468-71) **Materials for coal conversion and use. Volume III. Materials of construction for advanced power systems.** Nangia, V.K. (Engineering Societies Commission on Energy, Inc., Washington, DC (USA)). Aug 1980. Contract AC01-77ET10679. 86p. NTIS, PC A05/MF A01.

ESCOE has reviewed present and past work on behavior of materials in coal conversion and utilization working environments. The report on this review consists of three volumes: Volume I - Materials of Construction in Atmospheric Fluidized Bed Coal Combustion, Volume II - Materials in Coal Gasification and Liquefaction, and Volume III - Materials of Construction for Advanced Power Systems. Volume III briefly describes two advanced coal-based power generation systems and their materials-related problems: (1) Integrated coal gasifier-molten carbonate fuel cell power plant with steam turbine/gas turbine bottoming cycle; and (2) Combined cycle power plant using pressurized fluidized-bed coal combustor.

31471 (FE—2621-10) **Evaluation of high chromium overlays to protect less alloyed substrates from corrosion in a coal gasification atmosphere. Quarterly report, December 1, 1978-February 28, 1979.** Sadowski, E.P. (International Nickel Co., Inc., Suffern, NY (USA). INCO Research and Development Center). 1979. Contract EF-77-C-01-2621. 53p. NTIS, PC A04/MF A01.

The 1000 hour exposure at 1800°F in the coal gasification atmosphere was completed. The gas composition consisted of 12% CO_2, 18% CO, 24% H_2, 5% CH_4, 1% NH_3, 1% H_2S, and 39% H_2O. The gas was exchanged hourly. A detailed description of the test procedure and operation is appended to this report. Visual observation of unwelded samples of the substrate after exposure indicate that the corrosive environment was quite severe. The 304L coupons were completely disintegrated and the INCONEL alloy 800H was scaled severely. The 310 SS appeared to be reasonably corrosion resistant. The overlays of INCONEL Filler Metals 72, and R139 appeared corrosion resistant whereas the 309 overlay formed a scale which spalled. Stress rupture testing of composite specimens is essentially complete. The composition of the substrate had most effects on the stress rupture strength and the overlaid INCOLOY alloy 800H had the highest stress rupture strength. Generally, the gas metal arc processes gave higher stress rupture strength than the submerged-arc process. Microprobe analysis for elemental distribution showed that a higher Cr content was maintained for a greater depth in the overlay with the submerged-arc process than with the inert gas processes. Conversely, the Fe content of the overlays was the lowest with the submerged-arc process. The amount of Cr of the overlays deposited by the INCONEL Filler Metal 72 was not affected appreciably by the composition of the substrate except in the fusion area.

31472 (FE—3031-5(Pt.1)) **Design and simulation of a recirculating bed reactor for coal hydrogasification. Final report, Part I. Recirculating bed hydrogasifier conceptual design and simulation results.** Bierl, T.W.; Bajdos, L.J.; McIver, A.E. (Carnegie-Mellon Inst. of Research, Pittsburgh, PA (USA)). Mar 1980. Contract AS01-78ET13336. 254p. NTIS, PC A12/MF A01.

Part I of this report presents a conceptual design of a recirculating bed hydrogasifier. The reactor is designed to operate at

1800°F and 44 atm on hydrogen, and it would convert 63% of coal carbon. A mechanical design is presented which utilizes U-bend crossovers, a unique mechanism for controlling loop pressure balance and a dense-phase coal injector for direct addition of agglomerating coals. Part II documents the software developed to perform a non-linear simulation of a recirculating bed reactor for coal hydrogasification. The software takes the form of a flowsheet simulator of limited, yet general applicability. The information herein serves as both a user's manual and a programmer's reference manual. Included are descriptions of how to use the software, how it works, and source listings of the code developed in DECsystem-20 FORTRAN V. Documentation on the use of the simulator for its intended purpose is contained in Part I. Part III presents a linear programming analysis of hydrogasification strategies. It attempts to establish the operating conditions of the hydrogasifier by placing it in the context of the complete process. The most surprising result was that a processing strategy which was allowed to produce a char product was no more efficient a means of producing methane than was a process which converted all of the coal.

31473 (FE—3031-5(Pt.2)) **Design and simulation of a recirculating bed reactor for coal hydrogasification. Final report, Part II. Software documentation of the non-linear simulator.** Gajdos, L.J.; Bierl, T.W. (Carnegie-Mellon Inst. of Research, Pittsburgh, PA (USA)). Mar 1980. Contract AS01-78ET13336. 178p. NTIS, PC A09/MF A01.

This report documents the software developed to perform a non-linear simulation of a recirculating bed reactor for coal hydrogasification. The software takes the form of a flowsheet simulator of limited, yet general applicability. The information herein serves as both a user's manual and a programmer's reference manual. Included are descriptions of how to use the software, how it works, and source listings of the code developed in DECsystem-20 FORTRAN V. Documentation on the use of the simulator for its intended purpose is contained in a companion volume to this report.

31474 (FE—3031-5(Pt.3)) **Design and simulation of a recirculating bed reactor for coal hydrogasification. Final report, Part III. Linear programming analysis of hydrogasification strategies.** McIver, A.E.; Bierl, T.W.; Gajdos, L.J. (Carnegie-Mellon Inst. of Research, Pittsburgh, PA (USA)). Mar 1980. Contract AS01-78ET13336. 179p. NTIS, PC A09/MF A01.

This report describes an initial attempt to examine the implications of the process design on the recirculating bed hydrogasifier (RBR) operating conditions and the efficiency of RBR hydrogasification. The results are both informative, and at times, counter-intuitive. The design and simulation of a recirculating bed reactor for coal hydrogasification requires that standards of performance be established for the hydrogasifier's operation. Primarily this means specifying optimal operating conditions - temperature, pressure, and carbon conversion; however, it also means identifying the best mechanisms for control of the reactor heat balance - i.e., heat recovery and/or heat addition. Unfortunately, the criteria for specifying the hydrogasifier's optimal process design encompasses the entire process. Two reasons account for this statement: first, within a product (methane); and, second, the process thermal efficiency ultimately dictates how much carbon is converted to methane. Thus, the design of the hydrogasifier is implicitly controlled by the process design. Alternate routes to methane production include both direct hydrogenation of coal and methanation of carbon monoxide with hydrogen. In turn, the hydrogen used in each of these previous reactions can be produced in a variety of ways. The key to effective process design is to select an optimal arrangement of these reactions such that a maximum thermal efficiency is achieved.

31475 (IITRI-M—6043-7) **Design, engineering and evaluationn of refractory liners for slagging gasifiers. Seventh quarterly technical progress report, April 1-June 30, 1980.** Firestone, R.F.; Hales, C.; Greaves, M.J. (IIT Research Inst., Chicago, IL (USA)). Jul 1980. Contract AC05-78OR13410. 33p. NTIS, PC A03/MF A01.

Temperatures in slagging gasifiers are in the 2500 to 3300°F range, which limits the materials that can be used. In addition, the combination of high pressure (up to 1500 psi) with water vapor and the presence of carbon monoxide and hydrogen can present corrosion problems for refractories. The silica in aluminum silicate materials is chemically attacked by hydrogen and may be removed either by formation of volatile silicon monoxide, or hydrosilicic acid, which is leached out and redeposited in another area of the gasifier. The action of carbon monoxide on iron compounds in refractories is also disruptive. Potential refractory failure mechanisms in coal gasifier assemblies include: gaseous corrosion from hydrogen, steam, carbon monoxide, carbon dioxide and alkalies; slag corrosion; abrasion and erosion due to high velocity particles in gas streams; thermomechanical failures resulting in hot spots on the shell; and condensation of acids when the steel shell temperature is below the acid dew point. Low iron, high alumina refractories are the presently preferred materials for coal gasification plants. The atmospheres and other conditions found in vessels used in coal gasification require the use of dense and insulating high Al_2O_3 refractory shapes and castables. Considerable research is required to establish optimum refractory system and design methods for slagging coal gasifiers. This program is a first attempt at the required research.

31476 (ORNL/TM—7232) **Fossil energy materials needs assessment.** King, R.T.; Judkins, R.R. (comps.). (Oak Ridge National Lab., TN (USA)). Jul 1980. Contract W-7405-ENG-26. 144p. NTIS, PC A07/MF A01.

An assessment of needs for materials of construction for fossil energy systems was prepared by ORNL staff members who conducted a literature search and interviewed various individuals and organizations that are active in the area of fossil energy technology. Critical materials problems associated with fossil energy systems are identified. Background information relative to the various technologies is given and materials research needed to enhance the viability and improve the economics of fossil energy processes is discussed. The assessment is presented on the basis of materials-related disciplines that impact fossil energy material development. These disciplines include the design-materials interface, materials fabrication technology, corrosion and materials compatibility, wear phenomena, ceramic materials, and nondestructive testing. The needs of these various disciplines are correlated with the emerging fossil energy technologies that require materials consideration. Greater emphasis is given to coal technology - particularly liquefaction, gasification, and fluidized bed combustion - than to oil and gas technologies because of the perceived inevitability of US dependence on coal conversion and utilization systems as a major part of our total energy production.

31477 (UCID—18748) **Statement by Douglas R. Stephens, Project Leader, in situ coal gasification, Lawrence Livermore National Laboratory to the Subcommittee on Energy Research and Development Senate Committee on Energy and National Resources.** Stephens, D.R. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). 29 Jul 1980. Contract W-7405-ENG-48. 24p. NTIS, PC A02/MF A01.

As a result of the repeated demonstrations of technical feasibility, underground coal gasification is becoming recognized as one of the most promising methods to produce clean fuels from deep unusable coal. Successful use of the technology would quadruple the US proven reserves of coal: from 0.4 trillion to 1.8 trillion tons. Such a resource, which is over twice the energy equivalent of the total recoverable oil in the world, is enough to last for hundreds of years. The cost of products such as synthetic natural gas or gasoline, which are so vital to our nation's economy, are estimated to be competitive with conventional sources. The process is environmentally benign. The Underground Coal Gasification and Unconventional Gas Research, Development, and Demonstration Act provides the goals and funding needed to develop commercial underground coal gasification within ten years, and with a very reasonable budget. UCG can make a significant and positive impact on the US energy economy if the bill is enacted.

LIQUEFACTION

REFER ALSO TO CITATION(S) 31456, 31459, 31462, 31464, 31469, 31476, 31481, 31512, 31518, 31520, 31717, 32558, 32875

31478 (CONF-800806—35) **Assessment of current research and development in support of the US liquefaction demonstration plants program.** Rodgers, B.R.; Edwards, M.S.; Brown, C.H.; Carlson, P.K.; Gambill, W.R.; Gilliam, T.M.; Holmes, J.M.; Krishnan, R.P.; Parsly, L.F. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01.

From 15. intersociety energy conversion engineering conference; Seattle, WA, USA (18 Aug 1980).

A program for demonstration of Solvent Refined Coal (SRC) technology at the 6000-ton/day level has been undertaken by the US Department of Energy (DOE) in conjunction with two industrial groups. The SRC-I process produces a clean solid boiler fuel with one stage of reaction. The SRC-II process produces a distillate liquid boiler fuel. The SRC-I and SRC-II processes are emerging technologies which are the focus of a number of current research and development (R & D) activities, including a 30- to 50-ton/day pilot plant operating at Ft. Lewis, Washington, a large process development unit (3 to 6 tons/day) operating at Wilsonville, Alabama, and numerous smaller-scale efforts within industry, at universities, and at government laboratories. In addition, other R & D activities, which do not focus directly on SRC technology, are providing results that are germane to the SRC Demonstration Projects. Personnel at the Oak Ridge National Laboratory (ORNL) have assessed current R & D activities and developed recommendations for R & D activities needed for adequate SRC demonstration plant designs. The results of this assessment include detailed discussions of current and planned R & D relevant to the problems identified and suggestions for appropriate R & D activities to support the designs for the SRC demonstration plants. Four classes of R & D activities are suggested: (1) continuation of present and planned activities; (2) coordination of

present and proposed activities and results; (3) extension/redirection of activities not involving major equipment purchase or modifications; and (4) new activities.

31479 (DOE/ET/10104—T1) **Solvent Refined Coal (SRC) process. Research and development report No. 53, interim report No. 29, August-November, 1978. Volume VI. Process development unit studies. Part 1.** (Pittsburg and Midway Coal Mining Co., Denver, CO (USA)). Jan 1980. Contract AC01-76ET10104. 136p. NTIS, PC A07/MF A01.

This report presents the results of seven SRC-II runs on Process Development Unit P99 feeding Pittsburgh Seam coal. Four of these runs (Runs 41-44) were made feeding coal from the Robinson Run Mine and three (Runs 45-47) were made feeding a second shipment of coal from the Powhatan No. 5 Mine. This work showed that both these coals are satisfactory feedstocks for the SRC-II process. Increasing dissolver outlet hydrogen partial pressure from approximately 1300 to about 1400 psia did not have a significant effect on yields from Robinson Run coal, but simultaneously increasing coal concentration in the feed slurry from 25 to 30 wt% and decreasing the percent recycle solids from 21% to 17% lowered distillate yields. With the Powhatan coal, a modest increase in the boiling temperature (approximately 35°F) at the 10% point) of the process solvent had essentially no effect on product yields, while lowering the average dissolver temperature from 851°F to 842°F reduced gas yield.

31480 (DOE/ET/10104—T2) **Solvent Refined Coal (SRC) process: trace elements. Research and development report No. 53, interim report No. 31, August 1976-July 1977. Volume III. Pilot plant development work. Part 6.** (Pittsburg and Midway Coal Mining Co., Englewood, CO (USA)). Mar 1980. Contract AC01-79ET10104. 98p. NTIS, PC A05/MF A01.

Results are presented on a study of the distribution and fate of 34 trace elements in the Solvent Refined Coal Process at the pilot plant located at Fort Lewis, Washington, and operated by The Pittsburg and Midway Coal Mining Co. under contract with the US Department of Energy. Neutron activation analysis was used to determine Ti, V, Ca, Mg, Al, Cl, Mn, As, Sb, Se, Hg, Br, Co, Ni, Cr, Fe, Na, Rb, Cs, K, Sc, Tb, Eu, Sm, Ce, La, Sr, Ba, Th, Hf, Ta, Ga, Zr, and Cu in feed coals, process solvent, Solvent Refined Coal (SRC), mineral residues, wet filter cake, by-product solvents, process and effluent waters and by-product sulfur. The sample points were chosen such that the major process streams were adequately described and that the major input and output materials were included. Atomic absorption spectrophotometry was used to measure the toxic elements Pb, Cd, Be in plant-derived solvents, effluent water and Hamer Marsh water. Specific methods were developed for analysis of a wide range of material compositions. The neutron activation analysis procedures were divided into short and long irradiation procedures for elements with short half lives (less than 3 hours) and intermediate to long half lives (8 hours to 5.2 years). Data are presented for a third equilibrium set of samples from the SRC-I process and compared to two similar sets analyzed previously. A material balance (or budget) was calculated for each element from the concentration data and the yields of each process fraction. Data are also presented on a study of carbon monoxide addition to the hydrogen stream and its effect on trace elements, and trace element data on a study of thirty-six plant effluent water samples taken during an SRC-I production run.

31481 (DOE/ET/10673—T1) **Transition metal-graphite catalysts for production of light hydrocarbons from synthesis gas. Interim report, August 1, 1976-April 30, 1978.** Rosynek, M.P. (Texas A and M Univ., College Station (USA). Dept. of Chemistry). May 1978. Contract AC01-76ET10673. 18p. NTIS, PC A02/MF A01.

The unusual and potentially significant selectivity behaviors exhibited by iron- and, particularly, cobalt-graphite intercalates during CO hydrogenation warrant continued investigation, using a differential/integral flow-type reactor capable of operating at elevated reaction pressure, i.e., 0 to 300 psig. Such a system will enable further characterization of these catalysts to be made in at least three important, but heretofore unexamined, areas: this will permit the rapid acquisition of such important data as comparative turnover frequencies and apparent activation energies for CO conversion. The accuracy, convenience, and flexibility of the measurements will be greatly improved with a flow-type reaction system. Measurements of deactivation properties perforce require the use of a flow reactor and cannot be meaningfully made using a closed reaction system. Particular emphasis will be placed on establishing the effects of varying pretreatment conditions on activity/selectivity responses of the graphitic materials compared to their supported homologs. Additional information about catalyst coking properties and consequent mass balances will also be obtainable from such experiments. The most important information accessible by an elevated-pressure flow reactor are the comparative dependences of product selectivities on reaction pressure for both pairs of catalysts. In view of the already greater tendency of iron- and cobalt-graphite catalysts to produce longer average product molecules than their spported counterparts, even at one atmosphere pressure, it is of obvious importance to determine whether this behavior persists at higher reaction pressures. The situation for cobalt-graphite will be of particular interest because of its unusually constant selectivity properties over a 100°C range of reaction temperatures.

31482 (FE—2044-49) **Partial liquefaction of coal by direct hydrogenation. Quarterly progress report, July-September 1979.** Falk, A.Y. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). 1979. Contract EX-76-C-01-2044. 21p. NTIS, PC A02/MF A01.

Seven additional reactor tests were made in the 1 TPH PDU; five of these were greater than 1 hour in duration. Twenty-one tests have been made with the PDU since the installation of the high-pressure product recovery system. Analysis indicates carbon conversion results consistent with previous testing. The carbon balances for the longer duration tests approach ~ 95%, with the unrecovered material believed to be liquid products. Several operational and hardware problems were encountered which slowed the test frequency somewhat. However, all of these problems have been resolved. Excessive char carryover into the liquid product recovery system was observed on several of the tests. This resulted from overfilling of the main char receiver due to inadequate performance of the char removal system and, as a consequence, cleaning of the condensers was required several times. By limiting the coal flow rates to < 1500 lbm, char carryover is not a problem. The gas-side main injector injection pressure drop was steadily increasing with continued use of the injector. Therefore, the reactor was disassembled and the injector inspected. After ~ 60 tests, the injector had suffered some heat-induced distortion which caused the increased pressure drop. Such deterioration will not occur with the hot-hydrogen-mode injector planned for long-term operation. Installation and checkout of the water-cooled heat recovery quench unit was completed and testing is in progress. Construction of the BTX recovery system is continuing. The process economic study is progressing well.

31483 (FE—2566-39) **Upgrading of coal liquids. Hydrotreating and fluid catalytic cracking of SRC-II process derived gas oils. Interim report.** Riedl, F.J.; deRosset, A.J. (UOP, Inc., Des Plaines, IL (USA). Corporate Research Center). Jul 1980. Contract AC01-77ET10131. 88p. NTIS, PC A05/MF A01.

The objective of this work was to evaluate the applicability of commercial UOP hydrotreating and fluid catalytic cracking (FCC) processes to gas oils derived from the SRC-II process. All FCC feedstocks used in these studies were the 400°F$^+$ fractions from the raw and hydrotreated products. Four different FCC feedstocks, ranging in hydrogen content from 8.66 to 10.59 wt-% were prepared by topping the raw SRC-II gas oil and hydrotreated SRC-II products to remove 400°F$^-$ material. Rerunning the raw SRC-II feed to remove 5.2 wt-% of the bottoms removed most of the heptane insolubles and Conradson carbon precursor. The UOP DCB catalyst was used for hydrotreating the raw SRC-II stock. Results of fluid catalytic cracking showed that feed hydrogen content is a dominant factor in conversion and yield structure. As the feed hydrogen content increased, both conversion and gasoline yield increased, and carbon deposition decreased. In the range of conditions investigated, gasoline Research octane numbers of 97.5 to 106.7 were obtained. The yields of 650°F minus distillates generated were as high as 93 vol-%. The yield and quality of alkylate from C_3/C_4 products were estimated to be comparable to those obtained from processing a petroleum derived vacuum gas oil provided the degree of hydrotreatment is sufficient. It is concluded that SRC-II gas oil, or other coal derived distillate of smilar quality, can be processed into high quality gasoline by use of current hydrotreating and FCC technology.

31484 (FE—2781-5) **Deuterium tracer method for investigating the chemistry of coal liquefaction. Quarterly technical progress report, October-December 1979.** Skowronski, R.P.; Ratto, J.J.; Heredy, L.A. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). Jan 1980. Contract AC01-77ET11418. 40p. NTIS, PC A03/MF A01.

The deuterium tracer method provides information on where the hydrogen is incorporated into the coal structure during hydrogenation. Emphasis during this quarter has been placed upon donor solvent coal hydrogenation. Tetralin or tetralin-d_{12} in a protium, deuterium, or nitrogen atmosphere, was used to elucidate the roles of gas-phase and solvent hydrogen. Experiments were conducted with (1) fully deuterated solvent and protium gas, (2) fully deuterated solvent and nitrogen, and (3) the all-protium form of the solvent with deuterium gas. The nitrogen atmosphere eliminates any reaction mechanisms in which radicals are stabilized by gas-phase hydrogen. Coal injection and rapid cooldown techniques were used to provide a well-defined reaction time. The combined solid and liquid products were solvent-fractionated into oil, asphaltene, preasphaltene, and residue portions. These fractions were analyzed to determine the amount of deuterium incorporated and the structural positions of the incorporation. Also, the elemental compositions of the

fractions were determined. The gas-phase products were analyzed for molar and isotopic compositions. The resulting data have given insight into the amount of hydrogen exchange that occurs in the gas phase.

31485 (FE—2781-6) **Deuterium tracer method for investigating the chemistry of coal liquefaction. Quarterly technical progress report, January-March 1980.** Skowronski, R.P.; Ratto, J.J.; Goldberg, I.B.; Heredy, L.A. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). Apr 1980. Contract AC01-77ET11418. 54p. NTIS, PC A04/MF A01.

The deuterium tracer method provides information on where the hydrogen is incorporated into the coal structure during hydrogenation. Emphasis has been placed upon donor solvent coal hydrogenation. Six experiments have been carried out. Tetralin or tetralin-d_{12} in a protium, deuterium, or nitrogen atmosphere was used to elucidate the roles of gas-phase and solvent hydrogen in donor solvent coal hydrogenation. In an experiment with deuterium gas and tetralin, while 13.5 atom % deuterium was incorporated into the tetralin, 38 atom % was incorporated into the coal products. When protium gas and tetralin-d_{12} were used, 23.4 atom % protium was taken up by the tetralin-d_{12} and 23 atom % deuterium was incorporated into the coal. When gas-phase hydrogen and a donor solvent are present, the net hydrogen uptake by the coal is about 1.5%, and it is 1.1% when a nitrogen atmosphere is used with a donor solvent. When fully-deuterated tetralin is used as the solvent, whether or not $^1H_2$ is present, an equilibrium protium distribution of approximately 8% in the aromatic positions, 17% in the β-positions, and 75% in the α-positions is found in the recovered tetralin-d/sub x/. The coal products from these experiments show preferential deuterium incorporation in α-aliphatic and aromatic positions; the structural position least susceptible to deuterium incorporation is the β-aliphatic position. On the basis of these results, it is clear that hydrogen from the gas phase is incorporated into the donor solvent. These results suggest that the α-aliphatic radical of the tetralin may act to channel gas-phase hydrogen into the coal during liquefaction.

31486 (FE—2893-52) **EDS coal liquefaction process development. Phase V. Monthly technical progress report, June 1-June 30, 1980.** Epperly, W.R. (Exxon Research and Engineering Co., Florham Park, NJ (USA)). Jul 1980. Contract AB01-77ET10069. 54p. NTIS, PC A04/MF A01.

High pressure bottoms recycle operations were conducted on the 50 pounds/day Recycle Coal Liquefaction Unit (RCLU) with Texas lignite from the Big Brown mine. Results indicate that significant conversion, yield and unit operability advantages can be obtained with Big Brown lignite by operating in the bottoms recycle mode, as compared to coal only operation. Yield data obtained from the one ton-per-day Coal Liquefaction Pilot Plant (CLPP) showed that the C_4-1000°F distillate yield was approximately 44% based on dry, ash-free coal compared to 47% for Wyoming subbituminous coal. No unusual coal-specific problems were noted. Preliminary results from liquefaction of neat bottoms on the Once Through Coal Liquefaction Unit (OTCLU) showed significantly higher (C_4-1000°F) liquid make and 1000°F$^+$ conversion for single pass CLPP bottoms when compared with equilibrium CLPP recycle bottoms. Work began on an engineering screening study to determine the impact of high pressure bottoms recycle on the relative economics of various bottoms processing options. A screening study was undertaken to evaluate various methods of calculating the Required Initial Selling Price (RISP) of coal liquids. Heat and material balances were completed to simulate high pressure vacuum bottoms recycle operations at ECLP within the fuel gas treating and DEA regeneration areas of the plant. A research guidance study was initiated to select preferred bottoms recycle operating conditions for subsequent CLPP operations with Wyoming (Wyodak mine) coal. Fluid bed combustion of vacuum bottoms to supply high-level process heat provides incentives comparable to hybrid boilers, another direct combustion option. Research and development on coal slurry fired heaters, conducted by outside organizations, is currently being reviewed.

31487 (FE—3048-4) **Molten alkali metal hydroxide catalyzed coal liquefaction. Final report, October 1978-September 1979.** Skowronski, R.P.; Heredy, L.A. (Rockwell International Corp., Palo Alto, CA (USA). Energy Systems Group). Mar 1980. Contract AC01-78ET13377. 124p. NTIS, PC A06/MF A01.

The most important results of this research are the following: With a 2/1 NaOH melt/coal ratio, conversions of >80% and liquid yields of >50% can be achieved under hydroliquefaction conditions using tetralin. NaOH is a more effective catalyst than KOH. NaOH affords very good heteroatom removal, particularly with respect to sulfur and nitrogen. At 400°C, some improvement in liquefaction is noted compared with the reaction at 425°C. Contacting is very important. Preliminary experiments indicated that impregnation of small amounts (2 wt %) of NaOH has some catalytic effect and improves conversion. Inconel 671 is a satisfactory material of construction for use with NaOH under hydroliquefaction conditions. Inconel 600, 617, 625, and 671 were tested as potential materials of construction for molten alkali metal hydroxide-catalyzed coal liquefaction. Coupons were tested in both the hydroxide-sulfide melt and in the vapor phase. The samples in the melt showed little evidence of corrosion, and the samples in the vapor phase showed even less. There had been some general surface attack of the samples in the melt, but no noticeable intergranular corrosion, no stress-corrosion cracking, and no pitting. Of the four samples, Inconel 671 showed the least corrosion with an estimated corrosion rate of 2.8 mils/year.

31488 (ORNL—5631) **Stability of coal-derived particles in organic media.** Rodgers, B.R. (Oak Ridge National Lab., TN (USA)). Aug 1980. Contract W-7405-ENG-26. 233p. NTIS, PC A11/MF A01.

Thesis.

Paraffins had previously been shown by a number of experimenters to produce agglomeration of particles in coal liquids. Microscopic examination of various solutions of the component classes with and without n-decane provided definitive evidence that agglomeration of solids did not occur in oils and resin solutions containing solids, unless asphaltenes were present. This observation provided early insight into the mechanism of agglomeration by adsorption of asphaltenes on particle surfaces. Empirical determinations of the stability of coal particle dispersions in pure hydrocarbon solvents were made by measuring their settling characteristics in solutions containing Aerosol OT (sodium di-2-ethyl-hexyl sulfosuccinate, commonly called AOT). Stability criteria for particles in aqueous electrolyte systems have been well established. A few authors have attempted an extrapolation to organic systems, generally concluding that, if significant charge exists, the stability criteria for aqueous systems can be used by taking into account the extended double layer of charge that exists in organic systems. With this consideration, the double layer repulsion-van der Waals attraction model indicates that the +24 mV charge on the coal-derived particles is sufficient for stability without the necessity to consider other factors such as steric hindrance. The zeta potentials measured herein were also shown to be related to the empirical stability as determined by settling characteristics. A mechanism for establishing the surface charge was developed based on conclusive observations from this work and is supported by the experiments of others. The proposed Coaloid model explains the high stability of particles in coal liquids. The stability of coal-derived materials during long-term storage was also an area of particular interest.

31489 (ORNL/TM—5684) **Performance of hydroclones for removing particles from viscous liquids.** Talbot, J.B. (Oak Ridge National Lab., TN (USA)). Aug 1980. Contract W-7405-ENG-26. 116p. NTIS, PC A06/MF A01.

The performance of a 1-cm diam, Dorr-Oliver hydroclone with slurries containing ~ 5 wt % solids in water-glycerin solutions was studied to evaluate the effects of fluid viscosity. Micron-sized particles of low-density solids (aluminum oxide, test dust, fly ash, or kaolin) were removed from solutions with viscosities ranging from 1 to 85 cP. Pressure drop across the hydroclone increased with increasing feed rate and viscosity. Gross and centrifugal efficiencies were found to increase with flow rate and decrease with viscosity. Liquid viscosities >10 cP had deleterious effects on the pressure drop and efficiency; thus useful separations were not attained. The particle diameter, corresponding to a point efficiency of 50%, decreased as the product of the inlet Reynolds number and the solid-to-liquid density ratio increased. The reduced efficiency curve was found to characterize the hydroclone performance.

31490 (ORNL/TM—7365) **Metallographic examination of surveillance coupons from the Wilsonville, Alabama, Solvent Refined Coal Pilot Plant, 1977-1978.** Baylor, V.B.; King, R.T.; Leslie, B.C.; Crouse, R.S.; Patko, A.J.; Taber, K.C. (Oak Ridge National Lab., TN (USA)). Jul 1980. Contract W-7405-ENG-26. 83p. NTIS, PC A05/MF A01.

Commercialization of the solvent refined coal (SRC) process requires corrosion-resistant yet economical materials of construction. A corrosion surveillance program was initiated at the Wilsonville, Alabama, SRC pilot plant to expose racks of welded specimens of engineering alloys to the various process conditions in major plant vessels. To observe the long-term cumulative exposure effects, sections were taken from the specimens after six months. The coupons were replaced in the vessels for another year and then reexamined. These sections were evaluated at ORNL by standard procedures. Microprobe analyses were performed on the scale on selected specimens. The scale, both on and below the surface, proved to be varying complex mixtures of oxides and sulfides sometimes intermixed with process stream material. Weight change records indicate that corrosion was not a serious problem during these exposures, with the coals processed to date.

31491 (SAND—80-0232C) **Kinetics and mechanisms of the hydroliquefaction of coal: Illinois No. 6, Burning Star Coal in SRC-II heavy distillate.** Thomas, M.G.; Bickel, T.C. (Sandia Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 12p. (CONF-800929—1). NTIS, PC A02/MF A01.

From American Chemical Society fall meeting; San Francisco, CA, USA (19 Sep 1980).

In order to establish a kinetic model for coal liquefaction, we have endeavored to determine a stepwise reaction mechanism. The proposed first step is the dissolution of coal. Data from microreactor runs in the temperature range 275-375°C - below typical liquefaction temperatures - are presented in Table III. There is a small solubility of coal in the solvent at low temperatures, and marked increases at temperatures between 275°C and 350°C. Equilibrium in terms of gas make and solubility are attained rapidly. Up to 350°C, the SRC-II solvent is depleted. Solvent is a reactant with coal. The stoichiometry of the coal-solvent reaction can be estimated by weight loss of solvent and net THF sols. Based upon these data, it appears that the reaction can be represented as 1 Coal + 3 Solvent → 3 Preasphaltene. This stoichiometry is also consistent with published values for molecular weights of solvent (250), preasphaltene (1000), and coal (2250). The stoichiometry and approximate molecular weights establish a mass balance for the initial dissolution step. It is seen that it is primarily the pentane insoluble fraction of the initial solvent - the heavier, more functional portion - that reacts with coal in this initial reaction. The second reaction step appears to be the decomposition of preasphaltene.

31492 (UCRL-Trans—11604) **Motor fuels and SNG from coal.** Hiller, H. Translated from *Erdoel-Erdgas Z.;* **96**: 76-80(1980). 26p. NTIS, PC A03/MF A01.

The classical coal-conversion processes for the production of motor fuels must be adapted to present economic and production conditions. Only the process sequence for Fischer-Tropsch synthesis plants has undergone continuous further development, stimulated by th existence of large industrial plants in this sector. Recently, methanol synthesis based on coal gasification and followed by gasoline synthesis has become possible on a large industrial scale. The economy of the various processes for converting coal to motor fuels and SNG is compared. It is observed that there are proven conversion processes which guarantee competitive supplies in view of the price trend in the crude-oil market. Immediate construction of such plants to reduce the dependence of West Germany on crude-oil supplies is advisable.

31493 **179th national meeting of the American Chemical Society. Vol. 25, No. 1. Liquid fuels from coal; coal liquids upgrading; and utilization of peat and lignite.** Washington, DC; American Chemical Society (1979). 301p. (CONF-800303—P4). University Microfilms International, Ann Arbor, MI $8.00.

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

The American Chemical Society, Division of Fuel Chemistry, held symposia on liquid fuels from coal, coal liquids upgrading, and utilization of peat and lignite at Houston, Texas, March 23-28, 1980. Volume 25, No. 1, contains preprints of papers presented. Twenty-four papers have been entered individually into EDB and ERA. (LTN)

31494 **Continuous hydroliquefaction tests of Australian brown coal.** Kelvin, N.V.P.; Lim, B.P.K.; Fredrickson, P.W. (Australian Coal Industry Research Labs., Ltd., North Ryde, Australia). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 10-15(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

The Australian state of Victoria possesses huge proven reserves (66.7 x 10^9 tonnes) of brown coal which have been shown (1-3) to be highly suitable for hydrogenation to liquid fuels. Previous ACIRL (3) batch autoclave tests on Victorian brown coal gave toluene-soluble liquid yields of 61% when hydrogenated in tetralin at 400°C for 4 hours at hydrogen pressure of around 21 MPa. Moreover, high yields of oil have been reported for the hydrogenation of German brown coals (similar to the Victorian variety) in large-scale continuous operations. Hydroliquefaction tests on a Victorian brown coal in ACIRL's 1 kg/h continuous reactor unit are reported here. The unit and supporting equipment have been described earlier with reference to black coal hydrogenation tests.

31495 **Comparison of methods for the determination of asphaltenes, oils and insolubles. Part II.** Schultz, H.; Mima, M.J. (Dept. of Energy, Pittsburgh, PA). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 18-24(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

This study has shown that materials high in asphaltenes are more difficult to analyze for their asphaltene content than materials of moderate asphaltene content. Indeed, one of the test methods failed completely to work with the test sample. As authors of the method report successfully applying the method to an SRC-I material, it was concluded that our results were caused by either of two things. First, although the specifications spelled out in the method were met, the Soxhlet thimbles were obtained from a different manufacturer than used by the originators and therefore may have been of a different porosity allowing fine particles through. Second, the SRC used was different than that reported on and may have been ground to a different average particle size. Four of the methods worked but were less precise, required more effort and produced analyses at a lower rate than they did with the more tractable medium asphaltene material. In spite of all the above, methods A, B, D, and E could be used to analyze high asphaltene materials but each will produced different results with the same material. Clearly a standard method is called for but whether one method can be devised that will be usable with coal derived materials of widely varying asphaltene content is problematical.

31496 **Composition of liquids from coals of different rank.** Sturm, G.P. Jr.; Dooley, J.E.; Thomson, J.S.; Woodward, P.W.; Vogh, J.W. (Dept. of Energy, Bartlesville, OK). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 25-36(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

On the whole, the compositional studies showed the coal liquids upgraded to about the same level of nitrogen removal were much more alike than different. There was some scatter in the compositions in terms of number of rings per molecule but no consistent trend with the rank of coal. Although the ranks of the coals covered the full range of practical interest for liquefaction, selection of additional coal samples covering an even greater range of coal rank might be of value in determining any possible dependence of coal liquid composition upon coal rank. The extent of upgrading influenced the ring-number distribution for liquids from a given coal. More extensive upgrading produced larger amounts of low-ring-number compound types, due in part to greater removal of heteroatoms and to additional cracking of alkyl linkages between ring systems. Finally, taking the results of this compositional study in conjunction with the results of the preparation of the coal liquids, liquids from lower-rank coals were more easily upgraded and somewhat more cracking to lower molecular weight components occurred at a given severity of upgrading.

31497 **Chemical composition of raw and upgraded anthracene oil and the chemistry of coal liquids upgrading.** Scheppele, S.E. (Oklahoma State Univ., Stillwater); Greenwood, G.J.; Pancirov, R.J.; Ashe, T.R. Contract EX-76-C-01-2011. *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 37-46(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

Anthracene oil was hydrotreated using flow-through trickle-bed reactors containing Co-Mo-alumina catalysts (3). The conditions are specified in Table I. Samples of the feedstocks and four reaction mixtures were separated using cation, anion, and complexation chromatography (4). The compound types and the weight percents of the individual homologs present in the acid, base, neutral nitrogen, and hydrocarbon + ether (neutral) fractions were determined from high- and low-resolutions FI/MS and high-resolution 70-eV EI/MS. The basic and neutral fractions were subjected to GC/MS analysis. The salient results are summarized.

31498 **Liquid sulfur dioxide: as an agent for upgrading coal liquid.** Philip, C.V.; Zingaro, R.A.; Anthony, R.G. (Texas A and M Univ., College Station). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 47-52(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

An approach to processing coal-derived liquid to utilize advanced petroleum refining technology. Physical and chemical characteristics of the coal liquid currently produced from the pilot plants is different from that of petroleum crude. Although various coals may appear different, there is a striking similarity in the nature of major chemical species present in the coal liquids from different sources. Analytical data on various coal liquids and various distillation cuts show that coal liquids are composed of bulk species such as straight chain hydrocarbons, asphaltenes, one or two ring alkylated aromatics (such as alkylated benzenes, indans and naphthalenes), phenols (alkylated phenols, indanols and naphthols). Straight chain hydrocarbons include slightly branched hydrocarbons such as pristine and phytane and long chain monoolefins. The concept of using sulfur dioxide for upgrading coal liquid is very attractive due to the fact that sulfur is going to be one of the large byproducts of any coal conversion technology. Liquid sulfur dioxide is a very good solvent for most of the bulk species in any coal liquid except for saturated hydrocarbons. Now the coal liquefaction technology is very costly due to several factors including consumption of large quantities of hydrogen to liquefy coal. The recovery of saturated hydrocarbon, the hydrogen rich fraction, from the coal liquid has great economic interest.

31499 **Hydrodesulfurization of dibenzothiophene catalyzed by sulfided CoO-MoO_3/γ-Al_2O_3: the reaction kinetics.** Broderick, D.H.; Gates, B.C. (Univ. of Delaware, Newark). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 53-65(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

A well-recognized concern in hydroprocessing is the consumption of expensive hydrogen. Considering quantitatively the marked differences in the kinetics reported here for hydrogenation and hydrogenolysis of dibenzothiophene, we recognize two important processing variables for minimizing the hydrogen consumption in hydrodesulfurization. Decreased H_2S concentrations (obtainable by recycle gas scrubbing) favor hydrogenolysis. The change in selectivity is dramatic for H_2S concentrations between about zero and 0.1 gmole/liter. Temperature also strongly influences the relative rates of hydrogenation and hydrogenolysis. As the temperature is raised, the relative rate of hydrogenolysis increases sharply. The selectivity for dibenzothiophene hydrogenolysis also increases with increasing concentration of quinoline, an inhibitor of both hydrogenation and hydrogenolysis reactions. It is important to remember than, in general, competition between the sulfur-containing reactant and other feed components may alter the kinetics presented here for qualitative guidance in process design and suggest that the form of the rate equation (modified to account for the presence of various inhibitors) could be of use in reaction engineering models for process simulation.

31500 Hydrogenation of aromatic hydrocarbons catalyzed by sulfided CoO-MoO_3/γ-Al_2O_3: reactivities, reaction networks, and kinetics. Sapre, A.V.; Gates, B.C. (Univ. of Delaware, Newark). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 66-77(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

There has been a surge of development work on processes for upgrading heavy fossil fuels, including coal liquids, shale oil, tar sands, and petroleum residua. Upgrading is normally effected by hydrotreating in the presence of catalysts like cobalt molybdate or nickel molybdate at 50 to 250 atm and 300 to 450°C. Hydrogenation of aromatics is also important in developing coal liquefaction technology exemplified by the donor solvent process and some forms of the solvent refined coal process; in these processes the product liquid undergoes catalytic hydrogenation and is then recycled to the liquefaction reactor, where it transfers hydrogen to the liquefying coal. The experiments reported here were carried out to establish the reactivities and reaction networks for hydrogenation of benzene, biphenyl, naphthalene, and 2-phenylnaphthalene as well as detailed kinetics of biphenyl hydrogenation in the presence of a commercial catalysts (sulfided cobalt molybdate, CoO-MoO_3/γ-Al_2O_3). Biphenyl and 2-phenylnaphthalene were chosen as model reactants in part because they are the principal aromatic products formed in the hydrodesulfurization of dibenzothiophene and of benzo[b]naphtho[2,3-d]-thiophene, respectively. The latter two compounds are typical of the least reactive sulfur-containing compounds found in the heavier petroleum residua and coal-derived liquids. Naphthalene was chosen because upon hydrogenation it forms tetralin, the most widely used model compound used as a hydrogen donor in coal liquefaction experiments.

31501 Hydrotreatment and biological test of SRC-II coal liquid. Sutterfield, D. (Dept. of Energy, Bartlesville, OK); Lanning, W.C.; Royer, R.E. *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 79-83(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

Distillate coal liquid from the SRC-II process was hydrotreated in a bench-scale process unit to provide a range of mildly upgraded products for compositional characterization and screening for mutagenicity. Hydrogen content of the liquid was increased from 8.4 to 12.24 wt-pct over the range of process conditions which removed essentially 100% of the nitrogen and 95% of the oxygen. Results of the Ames assay indicated mutagenic activity of the liquid product decreased by an order of magnitude for 35% removal of nitrogen and 52% removal of oxygen. Liquid product with 67% nitrogen removal and 82% oxygen removal showed no mutagenic activity distinguishable from that of the background samples. The full range of effect in decreasing mutagenic activity by the Ames assay was covered by relatively mild hydrotreatment, but assessment of potential human risk must be confirmed using additional mammalian tests.

31502 Catalyst deactivation in hydrotreating coal-derived liquids. Sivasubramanian, R. (Univ. of Delaware, Newark); Olson, J.H.; Katzer, J.R. *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 84-148(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

Ni-Mo/Al_2O_3 catalysts aged in hydrotreating coal-derived liquids were characterized by scanning electron microscopy, electron microprobe, and catalytic activity. Aged catalyst from three different sections of the trickle-bed reactor used for the hydroprocessing were plasma etched to remove the carbon coating and were then examined. An inner crust and an outer crust were observed on the exterior of the catalyst particles; the inner crust was not present on catalyst near the reactor exit. The inner crust was composed principally of titania; whereas the outer crust contained ferrous sulfide, silica, and traces of other metals. Titania was also deposited within the interior of the catalyst. The activities of fresh, aged, and regenerated (coke burnt off) catalysts were compared for hydrodesulfurization (HDS) and hydrodenitrogenation (HDN) using a mixture of dibenzothiophene and quinoline in n-hexadecane in a batch autoclave reactor. The aged catalyst was inactive for HDN and had very low activity for HDS. Burning the carbon off the catalyst resulted in approximately 60% recovery of the HDN activity and 50% recovery of the HDS activity compared to that of the fresh catalyst. Pseudo first-order rate constants were determined for each of the reactions in the quinoline and dibenzothiophene reaction networks.

31503 Catalyst assessment for upgrading short contact time SRC to low sulfur boiler fuels. Shih, S.S.; Angevine, P.J.; Heck, R.H.; Sawruk, S. (Mobil Research and Development Corp., Paulsboro, NJ). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 152-163(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

Short contact time SRC can be upgraded via catalytic hydroprocessing into low sulfur boiler fuels. However, the solid SCT SRC feedstock requires solvent dilution to reduce its viscosity. Furthermore, even for a 50 wt % W. Kentucky SCT SRC blend, all pilot units lines and valves have to be heat-traced above 350°F in order to achieve smooth mechanical operations. Catalytically, the SCT SRC is more susceptible to form an inhomogeneous product than the regular SRC, particularly where small pore catalysts are used. The upgrading costs can be significantly reduced through increased activity as well as efficient hydrogen utilization. A proprietary catalyst, Mobil HCL-2, and a developmental catalyst, Amocat 1A, were observed to have these two important properties. For hydroprocessing of the 50 wt % W. Kentucky SCT SRC blend, the aging rate was moderate with a 2 to 3°F/day of temperature rise required to keep constant desulfurization activity. The catalysts are believed to be deactivated by coke and metal depositions on the surface. A large buildup of iron and titanium was found in a narrow band of the catalyst exterior of a a spent catalyst. Improved catalyst aging in likely to occur by the use of an ebullated bed reactor, primarily by decreased interparticle coke formation as well as by mild abrasion of metal contaminants.

31504 Hydrotreating of SRC I product: optimization. Garg, D.; Tarrer, A.R.; Guin, J.A.; Lee, J.M. (Auburn Univ., AL). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 164-175(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

The proposed NSPS can be met by hydrotreating the coal liquids obtained by filtering the product from the coal dissolution stage. The desulfurization kinetics can be presented by two parallel first-order rate expression, and hydrogen consumption kinetics can be presented by a first-order rate expression. A linear relationship exists between total sulfur content and SRC sulfur content of the hydrotreated product. For the Western Kentucky bituminous No. 9/14 coal studied here, the maximum selectivity and lowest SRC conversion to oil for a fixed SRC sulfur content are obtained using the highest reaction temperature (435°C) and the shortest reaction time (≃ 7 min).

31505 Comparison of the hydrodesulfurization and hydrodenitrogenation activities of Monolith alumina impregnated with Co and Mo and Nalcomo 474 catalysts. Soni, D.S. (International Research and Tech. Corp., McLean, VA); Crynes, B.L. *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 176-187(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

The results of this study indicated that at the reactor operating conditions of 371°C and 1500 psig, the observed HDS activity based on unit surface area, was much higher for the Monolith catalyst as compared to the Nalcomo 474 catalyst when processing the heavier feedstock, i.e., Synthoil. But it was about the same when processing a lighter feedstock like Raw Anthracene Oil. Since the average pore radius and the intraparticle diffusion length of the Monolith catalyst were 87.6°A and 0.114 mm against 31°A and 1 mm of the Nalcomo 474 catalyst, the intraparticle diffusion was considered to be responsible for the lower observed activity of the Nalcomo 474 catalyst on the heavier feedstock. From the observed rates of reaction, the effectiveness factors for the Monolith and Nalcomo 474 catalysts were found to be 0.94 and 0.216, respectively, for the HDS of Synthoil.

31506 Laboratory batch liquefaction of low rank coals. Souby, A.M.; Owens, T.C.; Severson, D.E. (Univ. of North Dakota, Grand

Forks). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 233-244(1979). (CONF-80030.)—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

Laboratory autoclave studies of low rank coals, particularly lignitic coals, have been conducted in the Department of Chemical Engineering at the University of North Dakota over a period of nearly 15 years. Recent research work is focused on providing process support data for the surviving liquefaction technologies with particular emphasis on western low rank coals. Early work in the current program was directed to screening several liquefaction solvents. Two solvents were selected for subsequent work: one was a distilled anthracene oil and the second was hydrogenated distilled anthracene oil. One of the objectives of the research program is to study the effect on liquefaction yields of the identity and quantity of mineral constituents of the coal. Analyses of the coals and of the coal ashes are given. The elements often considered to be important in liquefaction are iron, calcium, magnesium, sodium, potassium, and sulfur. There is a considerable body of opinion that the various forms of iron sulfides are the primary catalysts in liquefaction. Analyses of liquefaction solvent and of reaction products are largely physical in nature. Solvent and slurry are characterized by vacuum distillation and by dissolution of the undistillable portion in tetrahydrofuran. Slurry material not soluble in THF was considered to be unconverted lignite or ash, and the ash was determined independently. Three distillate fractions were determined in the vacuum (5 torr) distillation.

31507 Characterization of light oils from liquefaction of lignite. Farnum, S.A.; Olson, E.S.; Farnum, B.W.; Willson, W.G. (Dept. of Energy, Grand Forks, ND). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 245-255(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

The light oil 28-14 was separated into four fractions. The basic fraction was heterocyclic in nature containing most of the nitrogen compounds from the oil. The phenolic fraction was shown to be mostly phenols with naphthols only a minor constituent. The phenolic fraction is about 25% of the total weight of oil. The heteroaromatic fraction, 22%, contains few components with more than three rings. It is largely composed of naphthalene and naphthalene derivatives, probably some aromatic ethers, neutral or slightly acidic nitrogen compounds and all of the sulfur compounds. The hydrocarbon fraction is the major fraction, 48%. It has no functionality as the elementary analysis shows no O, N, or S. This fraction is aliphatic in nature with some benzenoid substituents. In addition to the observed yield distribution approaching a constant value, which is one indication of line-out, by monitoring the aromatic to aliphatic proton ratio as a function of recycle pass number with IR or NMR spectrometry, the approach to constant composition can be determined.

31508 Dissolution of lignite in anhydrous liquid ammonia. Harris, R.L.; Simons, L.H.; Lagowski, J.J. (Univ. of Texas, Austin). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 264-272(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

The general strategy involves using the unusual solvent properties of liquid ammonia as a means to solubilize relatively large fractions of coal-substances at low temperatures and thereby providing (1) a method of obtaining potentially useful carbon-containing compounds directly and (2) information on the chemical nature of the original coal-substance. Solubility in a two-component system involves a consideration of the attractive forces which exist between solute and solvent, solvent and solvent, and solute and solute; the attractive forces in the first instance favor the solubility of one substance in another, whereas the last two types of interactions oppose solubility. Because of its moderate dielectric constant, high dipole movement, ability to hydrogen bond, and relatively high basicity, liquid ammonia is a remarkably versatile solvent. The potential of ammonia to react with certain functional groups to produce soluble products also provides an additional advantage in the solubilization processes. A consideration of the polarity of the ammonia molecule as well as the dispersion forces generated by it suggest that ammonia should be a good solvent for covalently bound polar groups. In addition, arguments based on internal pressure considerations indicate that aromatic hydrocarbons and molecules containing polarizable atoms should exhibit a reasonable degree of solubility in liquid ammonia. Molecules which contain highly polar functional groups such as the carbonyl moiety that can interact strongly with the solvent dipole might be expected to interact strongly with liquid ammonia. In addition, an enhancement of solubility would be expected in the presence of π groups which can form hydrogen bonds to ammonia. Lastly, molecules possessing acidic hydrogen atoms such as carboxylic acids or phenolic groups react with liquid ammonia to form ammonium salts which should be soluble in liquid ammonia.

PYROLYSIS AND CRACKING

31509 (BNL—51107) Flash hydropyrolysis of coal. Quarterly report No. 9, April 1-June 30, 1979. (Brookhaven National Lab., Upton, NY (USA)). Oct 1979. Contract AC02-76CH00016. 136p. NTIS, PC A07/MF A01.

Both the North Dakota lignite and New Mexico sub-bituminous coal have been hydrogasified in the Flash Hydropyrolysis unit with yields ranging up to about 85 to 90% conversion of the available carbon at 2500 psi and 875 to 900°C. The lignite appears to be less reactive at lower pressure than the sub-bituminous coal, producing an average of 40% gaseous yield at 1000 psi and 900°C while the sub-bituminous produced over 50%. The reactivity of both coals is dependent on the hydrogen partial pressure but does not appear to be affected by H_2/coal feed ratio. When the H_2/coal ratio was reduced to 0.05 and sub-bituminous coal was run at 2500 psi and 875°C, a high methane concentration of 57% was achieved. However, the yield or conversion of carbon to gas was limited to 30% which may be attributed to the reduction in hydrogen partial pressure during the run. Further work is being planned to obtain additional data at the lower pressure and H_2/coal feed ratios. Illinois No. 6 coal, a caking bituminous, has been successfully run in the experimental equipment both treated with calcium and untreated. A reaction model, previously developed, has been modified and is being fitted to all the lignite data to produce one consistent set of pre-exponential factors and activation energies for the reaction rate equations. The experimental equipment is being modified to allow varying feed composition and especially introduction of steam into the feed gas.

31510 (EGG-EA—5136) Andco-Torrax incinerator model program description. Fryer, M.; Fink, R. (EG and G Idaho, Inc., Idaho Falls (USA)). May 1980. Contract AC07-76ID01570. 72p. (ISD-SCD—80-21). NTIS, PC A04/MF A01.

The incinerator model INCINR is a steady-state stoichiometric model of the gasifier and secondary combustion chamber in an Andco-Torrax slagging pyrolysis incinerator system. The model is designed for interactive use under INTERCOM on the INEL CYBER computer system. It is coded in standard FORTRAN IV (ANSI 1966) with the exception of the list-directed input feature of CDC Extended Fortran, Version 4.

31511 Thermal cracking of coal-derived materials. Bernhardt, R.S.; Ladner, W.R.; Newman, J.O.H.; Sage, P.W. (National Coal Board, Cheltenham, England). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 188-198(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

The results from the thermal cracking of unhydrogenated and hydrogenated coal-derived materials, a gas condensate and model compounds led to the conclusions that: (1) only low (< 3.5%) BTX and ethylene yields were obtained by cracking the vapours from a bituminous coal, an anthracene oil and the anthracene oil extract of the coal; (2) the BTX and ethylene yields increased with increasing extent of hydrogenation of the extract (which increased the naphthene content); tar was mainly derived from the aromatic and hydroaromatic components; (3) about 27% BTX ald 24% ethylene were obtained from the highly hydrogenated coal extract; in comparison, a paraffinic North Sea gas condensate gave 16% BTX and 30% ethylene; (4) the product yields from mixtures of model compounds were predicted to within +-2% from those of the constituents. The model compound studies confirmed that the molecular structure of the hydrogenated coal extract is of paramount importance in determining the product pattern: hydroaromatics dehydrogenate to aromatics, which either survive or polymerize to tars and, eventually, to carbon; naphthenes crack principally to BTX and ethylene; aliphatics mainly give small unsaturates such as ethylene and butadiene. The abnormally low yield of BTX from the mesitylene is attributed to its high symmetry and thermal stability.

SOLVENT EXTRACTION

31512 Refining the process that refines the coal. Whitaker, R.; Lebowitz, H. *EPRI J.;* **5**: No. 4, 21-25(May 1980).

First operated in 1973 to refine a sulfur-free solid fuel from coal, the Electric Power Research Institute's small pilot plant at Wilsonville, Alabama, is now a focal point for research and development in coal liquefaction. The solvent-refined coal process (SRC) is largely free of ash and so low in sulfur content that it can be burned without flue-gas desulfurization. The SRC, while still in the liquid form, is now being investigated as an intermediate product to be further upgraded into liquid boiler and turbine fuels. The segment of the process that is the principal focus at present is the separation of ash and unconverted coal residue from the SRC stream after it leaves the reaction section of the plant. Several techniques to upgrade the fuel have been tested at Wilsonville. The solvent extraction method known as critical solvent de-ashing will be combined with a catalytic hydrogenation unit to produce more liquid fuel as well as low-sulfur SRC in the near future. (SAC)

BY-PRODUCTS

REFER ALSO TO CITATION(S) 31603, 31604

31513 Organic structural studies of lignite coal tars. Miller, D.J.; Olson, J.K.; Schobert, H.H. (Dept. of Energy, Grand Forks, ND). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* 25: No. 1, 256-263(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

A previous publication presented data on the low-voltage mass spectrometric analysis of nine tar samples obtained from the gasification of four low-rank coals at a variety of gasification conditions. Extensive statistical analysis of the data, similar to that presented here, showed that the major factors affecting tar composition are the partial pressure of hydrogen and the residence time of the coal in the gasifier. These results agree with conclusions developed in other laboratories. The success obtained in deriving these relationships from the mass spectrometric analyses and the agreement with known behavior of other systems led to the present study in which attention was focused on two tar samples obtained from the gasification of similar lignites under identical conditions. The results reported here are compared with data from other laboratories to suggest relationships between tar composition and possible structural features in the parent lignites. The good correlation between the quantities of compounds in Indian Head tar and the thermal stabilities of those compounds indicates that the organic units found in the tar are the survivors of thermal degradation processes in the gasifier. At the same time, however, the relationships between the compound types in the tar and those obtained from mild solvent extraction conditions suggest that the molecular structures in the tar are determined not only by thermal processes but also by structural relationships in the parent lignite. Since tar structures very likely reflect coal structures, differences in the tar analyses can be related to structural differences in the coals. The development of an understanding of the effect of the molecular frameworks in coal and the likely mechanisms of tar formation will assist in assessing and predicting the chemical nature of such effluents.

PROPERTIES

REFER ALSO TO CITATION(S) 31453, 31458, 31486, 31591, 32198

31514 (ACIRL-PR—79-8) **Petrographic analysis of an Australian coking coal blend: International Committee for Coal Petrology ring analysis 1. exercise 1978/79.** Burke, L.O. (Australian Coal Industry Research Labs., North Ryde). 1979. 43p. Australian Coal Industry Research Labs., North Ryde.

On behalf of the International Committee for Coal Petrology, Australian Coal Industrys Research Laboratories Ltd., organised an international ring analysis; the sample used was a high inertinite feed coal for a coke-oven battery. Analyses conducted were maceral group analysis, vitrinite reflectance, microlithotype analysis and inertinite reflectance. In addition, each participant was requested to predict the physical strength of the coke produced from the sample. A sample of wharf coke, taken so as to correspond to the sample of battery feed, was tested using standard coke drum test procedures. The results obtained by the participating laboratories for all analyses shared a large range of values.

31515 (ACIRL-PR—79-12) **Prediction of mining conditions from bore core information: rock mechanics investigations in the Wongawilli Seam at Huntley Colliery.** Hebblewhite, B.K.; Hall, R.T. (Australian Coal Industry Research Labs., North Ryde). Oct 1979. 32p. Australian Coal Industry Research Labs., North Ryde.

Rock mechanics investigations were conducted at Huntley Colliery as part of the series designed to study stability of mining structures and to obtain geo-mechanical properties. The roof and floor were drilled in order to obtain core for rock testing and coal samples were collected. An estimate of the stress field was made. The core which was recovered was logged prior to laboratory testing to determine a C index (modified RQI) index based on core fragmentation). This was used to estimate the in-situ strata properties from laboratory results. The roof material was found to be a composite of weak shale and coal interspersed with strong bands of sandstone and tuff. Finite element analysis indicated very stable conditions for the roadway geometry considered.

31516 (ACIRL-PR—79-15) **Prediction of mining conditions from bore core information: rock mechanics investigations in the Liddell Seam at Liddell State Mine.** Richmond, A.; Smith, K. (Australian Coal Industry Research Labs., North Ryde). Nov 1979. 36p. Australian Coal Industry Research Labs., North Ryde.

Rock mechanics investigations were conducted at Liddell State Mine as part of the series designed to study the stability of mining structures and obtain geomechanical properties. The roof and floor were drilled in order to obtain core for rock testing and samples of coal were collected to measure the coal properties. It was not possible to obtain absolute stress measurements due to instrumentation difficulties and so an estimate of the stress field was made. The core which was recovered was logged prior to laboratory testing to determine a C index (modified RQD index based on core fragmentation). This was used to estimate the in-situ strata properties from the laboratory results. The roof material consisted of a weak coal and shale for the immediate 2.4 m, and this was overlaid by a competent siltstone. The Liddell seam coal within the mined section had an average uniaxial strength of 24 MPa. The immediate 1.5 m of floor material consisted of coal with the remaining floor strata drilled being weak interbedded coal and mudstone. Finite element analyses indicated stable roof and floor conditions apart from minor guttering of the immediate roof in the corner of the roadway. This correlated well with initial underground conditions.

31517 (ACIRL-PR—79-17) **Prediction of mining conditions from bore core information: rock mechanics investigations in the Whybrow Seam at Wambo Colliery.** Richmond, A.; Levers, R.; Smith, K. (Australian Coal Industry Research Labs., North Ryde). Dec 1979. 36p. Australian Coal Industry Research Labs., North Ryde.

Rock mechanics investigations were conducted at Wambo Colliery as part of the series designed to study the stability of mining structures and obtain geomechanical properties. The roof and floor were drilled in order to obtain core for rock testing and samples of coal were collected to measure the coal properties. A successful overcoring of a CSIR strain cell was achieved to determine the absolute stress field. The core which was recovered was logged prior to laboratory testing to determine a C index (modified RQD index based on core fragmentation). This was used to estimate the in-situ strata properties from the laboratory results. The roof material was found to consist predominantly of a competent laminite. The Whybrow seam above the Cow Manure band had an average uniaxial strength of 26 MPa. The Cow Manure band was extremely weak with a strength of 1 MPa, while the coal below this band was much weaker than the upper section coal with a strength of 7 MPa. The floor strata was made up of competent carbonaceous siltstone and alternate bands of shale and sandstone. Finite element analyses indicate very stable roof, floor and rib, corresponding closely to the in-situ conditions.

31518 (BMI—2063) **Thermophysical properties of coal liquids. Third quarterly technical status report, April 1-June 30, 1980.** Droege, J.W.; Stickford, G.H.; Cauhan, S.P. (Battelle Columbus Labs., OH (USA)). 23 Jul 1980. Contract AC01-79ET14941. 41p. NTIS, PC A03/MF A01.

The purpose of the program is to determine certain physical properties of coal-solvent slurries, namely, viscosity, thermal conductivity, density, heat of reaction, and specific heat, as these slurries undergo dissolution reactions. Viscosity determinations on coal-solvent slurries have proceeded satisfactorily up to a temperature of about 570°K (566°F). At about that temperature in every case the bob stopped moving. Attempts to operate in this temperature range by more rapid bob movement, by using a more dilute slurry and by substituting a more viscous solvent did not succeed in overcoming the difficulty, which seems to be related to the formation of a semi-solid rather than to the separation of solids from the suspension. A transient line source technique has been used for the measurement of thermal conductivity. Both platinum and tungsten wires have been used to reproduce reference data for toluene. Measurements on the solvent have been made at modest temperatures. Initial calorimetric measurements using a pressurized differential scanning calorimeter have yielded mixed results. The instrument has been calibrated with melting metals in the presence of hydrogen. The stability of the output curve has been inadequate. Modifications to the instrument are planned.

31519 (CONF-7906177—1) **Structure and chemistry of coals: calorimetric analyses.** Fuller, E.L. Jr. (Oak Ridge National Lab., TN (USA)). 1979. Contract W-7405-ENG-26. 19p. NTIS, PC A02/MF A01.

From 54. colloid and surface science symposium; Bethlehem, PA, USA (Jun 1979).

Heats of immersion (h/sub i/) of coals have been shown to be a valuable means of investigating structure and chemistry of coals. This report outlines some of the factors involved. Lower ranked coals imbibe more liquids (i.e., H_2O) onto more polar sites (carbonyl, phenolic, etc.) than higher ranked coals. Mineral matter reacts strongly with polar liquids (i.e., H_2O) giving rise to enhanced h/sub i/. Grinding of coals not only decreases particle size but modifies the coal structure to an increasing degree dependent upon the extent and severity of grinding. The magnitude of h/sub i/ and the rate of reaction are both modified consistent with the existence of a shrinking core or unperturbed coal structure serving as substrate to which the modified (less ordered) material is bound. Chemical (alkali) attack seems to loosen the coal structure markedly to allow en-

hanced access to fluid reagents. These exploratory studies have shown that calorimetric analyses similar to those developed and used by A.C. Zettlemoyer and his coworkers are excellent means for elucidating the structure and chemistry of coals and related materials.

31520 (PNL—3464) **Initial chemical and biological characterization of hydrotreated solvent refined coal (SRC-II) liquids: a status report.** Weimer, W.C.; Wilson, B.W.; Pelroy, R.A.; Craun, J.C. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jul 1980. Contract AC06-76RL01830. 56p. NTIS, PC A04/MF A01.

This report presents the results of both chemical and biomedical research performed on a solvent refined coal (SRC-II) research material (distillate blend) which was produced by the pilot plant facility at Fort Lewis, Washington. Samples of this distillate blend were subjected to research-scale hydrotreatment by Universal Oil Products, Inc., prior to chemical and biological analysis at PNL. The samples are considered to be, in general, generically representative of raw or hydrotreated materials which might be produced by demonstration or commercial-scale facilities. The above described feedstock and hydrotreated materials were analyzed for chemical composition both prior to and after chemical fractionation. The fractionation procedure used was an acid-base-neutral solvent extraction. The fractions produced, as well as the unfractionated materials, were subjected to microbial mutagenesis testing (Ames assay) and to further chemical analysis. The principal components of the unmodified distillate blend are two and three ringed aromatic and heteroatomic species together with high concentrations of phenolic and polynuclear aromatic components relative to typical levels found in petroleum crudes. The Ames assay mutagenic response for the unfractionated material, as well as the fractions produced by the solvent separation, was reduced considerably in the hydrotreated materials compared to that of the feedstock. Total mutagenic response for the hydrotreated products was approximately 1% of that in the untreated feedstock. The concentrations of two important genetically active compound classes, the polynuclear aromatic hydrocarbons and the primary aromatic amines, were considerably reduced in both of the hydrotreated products compared to the feedstock.

31521 **Direct determination of polynuclear aromatic hydrocarbons in coal liquids and shale oil by laser excited Shpol'skii spectrometry.** Yen, Y.; D'Silva, A.P.; Fassel, V.A.; Iles, M. (Iowa State Univ., Ames). Contract W-7405-ENG-82. *Anal. Chem.;* **52**: No. 8, 1350-1351(Jul 1980).

This article reports that tunable, dye laser excitation of Shpol'skii effect spectra provides a potentially useful means of determining PAH compounds directly in coal liquids and shale oil without prior isolation of the PAH fraction by chromatographic or other techniques. The data reported were obtained by selecting excitation wavelengths within the response curve of a single dye, 2-(4-biphenylyl)-5-phenyl-1,3,4 oxadiazole (PBD). The characteristic low temperature excitation spectra of PAH compounds in appropriate Shpol'skii matrices are known to be sharp (FWHM $\sim 10cm^{-1}$). The luminescence of four individual PAHs is included. The analytical results obtained for a typical solvent refined coal and shale oil sample are summarized. 2 figures, 1 table. (DP)

31522 **Current research on the inorganic constituents in North Dakota lignites and some effects on utilization.** Rindt, D.K.; Karner, F.R.; Beckering, W.; Schobert, H.H. (Dept. of Energy, Grand Forks, ND). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 210-218(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

The results presented exemplify the types of broad-ranging studies, which, it is hoped, will eventually provide an extensive data base on the origin, distribution, characteristics, and process behavior of the major inorganic species in lignites. For example, the hydrogeochemical history of a lignite deposit and the mineralogy of the overburden and underclay play an important role in determining the amount and distribution of sodium in the lignite. That sodium may then have a detrimental effect on the utilization of the lignite - by contributing to ash fouling - or it may have a beneficial effect - by reducing slag viscosity in a slagging gasifier. Continued research will allow coal scientists to follow the fate of the inorganic species from the Paleocene epoch to tomorrow's synfuels technology.

31523 **Analysis of the inorganic constituents in American lignites.** Morgan, M.E.; Jenkins, R.G.; Walker, P.L. Jr. (Pennsylvania State Univ., University Park). Contract EX-76-C-01-2030. *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 219-223(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

The research described here was concerned with the characterization of the ion-exchangeable cations and the carboxyl groups with which they are associated for three important deposits of American lignites. This has been accomplished by ion-exchange techniques, utilizing ammonium acetate and barium acetate, respectively. The cations analyzed for were Na, K, Mg, Ca, Sr, and Ba. Also the amounts of the major discrete mineral phases present in the lignites have been determined. This was accomplished by the use of semi-quantitative x-ray diffraction and infrared spectroscopy techniques.

WASTE MANAGEMENT

REFER ALSO TO CITATION(S) 31552, 32634, 32778

31524 (BM-IC—8819) **Analytical chemistry of the citrate process for flue gas desulfurization.** Marchant, W.N.; May, S.L.; Simpson, W.W.; Winter, J.K.; Beard, H.R. (Bureau of Mines, Salt Lake City, UT (USA). Salt Lake City Research Center). 1980. 22p. Dept. of Interior, Washington, DC.

The citrate process for flue gas desulfurization (FGD) is a product of continuing research by the US Bureau of Mines to meet the goal of minimizing the objectionable effects of minerals industry operations upon the environment. The reduction of SO_2 in solution by H_2S to produce elemental sulfur by the citrate process is extremely complex and results in solutions that contain at least nine different sulfur species. Process solution analysis is essential to a clear understanding of process chemistry and its safe, efficient operation. The various chemical species, the approximate ranges of their concentrations in citrate process solutions, and the analytical methods evolved to determine them are hydrogen sulfide ($\sim$ 0M to 0.06M) by specific ion electrode, polysulfides (unknown) by ultraviolet (uv) spectrophotometry, elemental sulfur ($\sim$ 0M to $\sim$ 0.001M dissolved, $\sim$ 0M to $\sim$ 0.1M suspended) by uv spectrophotometry, thiosulfate ($\sim$ 0M to $\sim$ 0.25M) by iodometry or high performance liquid chromatography (HPLC), polythionates ($\sim$ 0M to $\sim$ 0.01M) by thin layer chromatography (TLC), dithionite (searched for but not detected in process solutions) by polarography or TLC, bisulfite ($\sim$ 0M to 0.2M) by iodometry, sulfate ($\sim$ 0M to 1M) by a Bureau-developed gravimetric procedure, citric acid ($\sim$ 0M to 0.5M) by titration or visible colorimetry, glycolic acid ($\sim$ 0M to 1M) by HPLC, sodium ($\sim$ 1.5M) by flame photometry, and chloride by argentometric titration.

31525 (DOE/ET/10415—T1) **Development of potential uses for the residue from fluidized bed combustion processes. Quarterly technical progress report, March-May 1980.** Minnick, L.J. (Minnick (L.J.), Inc., Plymouth Meeting, PA (USA)). 1980. Contract AC21-77ET10415. 24p. NTIS, PC A02/MF A01.

Results of tests on expansion bars made from conditioned and chemically processed AFB residue showed levels of expansion confirming that ettringite formation may be the main cause of the volume instability observed in road base compositions containing AFB residue. AFB fly ash, when treated with acid washing to remove calcium, has shown an ability to function as an ion exchange material. Further tests have shown that treatment of AFB fly ash by acid washing and the addition of zinc chloride produced a material that behaves like activated carbon in terms of color removal from water. Observations from ten different mix compositions using AFB residue, pulverized coal fly ash, and, in some cases, a gypsum waste sludge, have shown that briquettes having acceptable green strength for normal handling can be made from most formulations using a laboratory scale roll briquetting machine. Loose slurry mixes containing various proportions of AFB residue and pulverized coal fly ash develop sufficient compressive strengths at comparatively low permeabilities to recommend further investigation of their potential use as an expansive grouting material. The addition of portland cement in amounts of 1 to 5 percent for each mix did not significantly affect strength development in any of these mixes.

31526 (DOE/ET/11070—T1) **Reconnaissance and processing of impounded coal wastes. Quarterly report, April 1, 1980-June 30, 1980.** Browning, J.S.; Hilleke, F. (Alabama Univ., University (USA). Mineral Resources Inst.). 1980. Contract AS01-78ET11070. 26p. NTIS, PC A03/MF A01.

The Department of Energy is funding a study to sample, test and analyze coal impoundments in Alabama to determine the quantity of coal in place, and the quantity, and quality of recoverable coal in each impoundment. A second objective of the work is to sample the washery wastes currently discharging into the impoundments, and to determine the quantity and quality of coal recoverable. Drilling equipment and sampling methods are described. The four impoundments evaluated so far contain 1,951,000 tons of raw coal of which 761,000 tons of clean, marketable coal can be recovered. (LTN)

31527 (DOE/EV—0081) **Processing needs and methodology for wastewaters from the conversion of coal, oil shale, and biomass to synfuels.** (California Univ., Berkeley (USA). Dept. of Chemical Engineering). May 1980. Contract AT03-79EV10227. 185p. (CONF-7906104—). NTIS, PC A09/MF A01.

From Wastewater workshop; Germantown, MD, USA (14 Jun 1979).

The workshop identifies needs to be met by processing technology for wastewaters, and evaluates the suitability, approximate costs, and problems associated with current technology. Participation was confined to DOE Environmental Control Technology contractors to pull together and integrate past wastewater-related activities, to assess the status of synfuel wastewater treatability and process options, and to abet technology transfer. Particular attention was paid to probable or possible environmental restrictions which cannot be economically met by present technology. Primary emphasis was focussed upon process-condensate waters from coal-conversion and shale-retorting processes. Due to limited data base and time, the workshop did not deal with transients, upsets, trade-offs and system optimization, or with solids disposal. The report is divided into sections that, respectively, survey the water usage and effluent situation (II); identify the probable and possible water-treatment goals anticipated at the time when large-scale plants will be constructed (III); assess the capabilities, costs and shortcomings of present technology (IV); explore particularly severe environmental-control problems (V); give overall conclusions from the Workshop and recommendations for future research and study (VI); and, finally, present Status Reports of current work from participants in the Workshop (VII).

31528 **Analysis for sulphur in coal ash.** Botto, R.I.; White, B.H.; Karchmer, J.H. (Exxon Res and Eng Co, Baytown, Tex). *Fuel;* **59**: No. 3, 157-160(Mar 1979).

Highly precise and accurate sulphur analyses are required to establish material balance for sulphur in utility boilers where sulphur is present at low levels in the fly ashes. Sulphur determinations using the established methods depend on quantitative extraction of sulphur from some form of sample decomposition residuum. X-ray fluorescence procedure developed in this study, yields results which have the precision and accuracy required for material balance calculations. Using this method, fly ash samples containing less than 1% sulphur can be determined. 3 refs.

ENVIRONMENTAL ASPECTS

REFER ALSO TO CITATION(S) 31453, 32820, 32868, 32875, 32878

31529 (ANL/ECT—8) **Survey of environmental-control technologies for industrial coal use.** Seward, W.H.; Hollis, J.R.; Opalanko, R.S. (Mittelhauser Corp., Downers Grove, IL (USA); Resource Engineering, Inc., Cambridge, MA (USA)). Dec 1978. Contract W-31-109-ENG-38. 177p. NTIS, PC A09/MF A01.

This report presents the results of a screening study done by Mittelhauser Corporation for Argonne National Laboratory. The purpose of the study is to examine current and possible future constraints on the use of coal and coal-derived fuels in industry. Current environmental regulations pertaining to industrial fuel usage are listed and summarized. A Technology-Applications Matrix (TAM), which correlates generic types of industrial fuel-burning equipment with potential fuels, is a key element in this report. The study has led to several conclusions. Current environmental constraints may reduce significantly the attractiveness of coal-derived solid fuels. Coal-derived medium-Btu gases and methanol are unlikely to be economically competitive with natural gas, fuel oil, or other coal-derived synthetic fuels by 1985. It is unlikely that National Energy Act provisions, which force conversion of industrial facilities to coal-use, will be effective in changing the industrial fuel-use pattern in the United States in the near future. The most attractive application of coal technology in the industrial sector appears to be direct use of high-sulfur coal with post-combustion pollution control. It is recommended that this alternative be examined, along with the use of atmospheric fluidized-bed combustion, coal-oil mixtures, solvent-refined coal liquids, and high-Btu synthetic gas.

31530 (CONF-800334—18) **Environmental control implications of coal use.** Wilzbach, K.E.; Livengood, C.D.; Farber, P.S. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 20p. NTIS, PC A02/MF A01.

From 2. DOE environmental control symposium; Reston, VA, USA (17 Mar 1980).

The Environmental Control Technology for Coal Utilization program at Argonne National Laboratory (ANL) is assisting DOE by providing information required in the planning and guidance of R and D programs for coal utilization technologies and the associated environmental controls. Both available and developing technologies for the entire energy system from the mine mouth through ultimate waste disposal are analyzed. The tools of technology assessment and systems analysis are used to provide balanced evaluations of the engineering, environmental, and economic aspects of the technologies, as well as identification of synergistic effects and secondary or indirect impacts. This paper deals with three topics: First, the assessments performed to date that indicate the nature of our current work are briefly reviewed. Next, the computerized models and data bases utilized in our assessments are described. Lastly, some of the results from a major ongoing study of environmental controls for industrial boilers are presented and their implications discussed.

31531 (CONF-800602—8) **Environmental assessment of HYGAS Pilot Plant streams.** Anastasia, L.J.; Evans, R.J.; Bossart, S.J.; Karst, R.H.; Biljetina, R. (Institute of Gas Technology, Chicago, IL (USA)). 1980. Contract AC01-76ET10261. 9p. NTIS, PC A02/MF A01.

From Symposium on instrumentation and control for fossil energy processes; Virginia Beach, VA, USA (9 Jun 1980).

The US Department of Energy has commissioned an environmental assessment program to obtain experimental data from the HYGAS Pilot Plant. An important objective of this program is the development of predictive methods to extend the environmental data base to larger-scale demonstration and commercial HYGAS coal gasification plants. This report discusses the systems which have been specifically established for sampling, analysis, and data evaluation to define the fate of compounds of environmental interest generated during pilot plant operation. The pilot plant units of interest include the pretreater and gasifier reactors which are considered scalable to larger plants. Sampling methods used in the program include scheduled, routine grab samples, composited grab samples, on-line composited liquids and solid samples, and on-line gas analysis for selected sulfur species. This paper also discusses the development and use of a high-pressure, high-temperature, sampling system to collect organic and inorganic species from the HYGAS gasifier. Even though the reactor sampling system adopted is very manpower intensive, it greatly reduces the number of samples required and results in a higher overall sampling efficiency. In addition, the on-line sampling train provides immediate capture and stabilization of reactive and volatile species, eliminates process unit lag times, avoids quench tower inefficiencies for many species, and allows rapid monitoring of differences in pollutant production with changing process conditions.

31532 (DOE/EIS—0072-F(Vol.1)) **Final environmental statement: Great Plains Gasification Project, Mercer County, North Dakota.** (Department of Energy, Washington, DC (USA). Assistant Secretary for Environment). Aug 1980. 557p. NTIS, PC A24/MF A01.

The statement assesses the potential environmental impacts associated with the construction and operation of a 250 million cubic feet per day coal gasification facility (although the present action will be a half-sized facility) and an associated 365 mile product pipeline. This project will demonstrate the technical operability, economic viability, and environmental acceptability of a high-Btu gas facility. Impacts addressed include potential impacts on terrestrial and aquatic ecology, including State and Federally-declared threatened or endangered species; expected impacts on land use; potential changes to the quality of surface and groundwater; compliance with State and Federal ambient air quality standards; and changes to the existing economic and social characteristics of nearby areas. Additionally, the statement presents an identification of potential hazards and associated with the operation of the proposed facility and plans for monitoring and controlling such hazards. Additionally, DOE has prepared an updated environmental analysis. Comments on this final EIS should be addressed to Mr. Phillip Gallo at the given address. Comments are due by September 15, 1980. No additional public hearing is scheduled.

31533 (DOE/EIS—0072-F(Vol.2)) **Final environmental statement: Great Plains Gasification Project, Mercer County, North Dakota.** (Department of Energy, Washington, DC (USA). Assistant Secretary for Environment). Aug 1980. 85p. NTIS, PC A05/MF A01.

This Supplement to the Final Environmental Impact Statement relates directly or indirectly to a proposal for the sale of synthetic natural gas (SNG) produced from coal commingled with natural gas, and for the construction and operation by Great Lakes Gas Transmission Company (Great Lakes) and Michigan Wisconsin of pipeline and compressor facilities to enable the receipt and transport of such gas. The Supplement evaluates the environmental impact resulting from construction and operation of these facilities. The facilities for which Great Lakes is seeking authorization include an interconnection between a proposed 20-inch diameter SNG pipeline and Great Lakes' existing 36-inch diameter pipeline system near the Thief River Falls Compressor Station in Minnesota; construction of 217.3 miles of new 36-inch diameter pipeline looping in eight sections across Minnesota, Wisconsin, and Michigan; utilization of 39.5 miles of existing 36-inch diameter pipeline looping in Minnesota; and modification of six compressor stations. Facilities required by Michigan Wisconsin included 27.7 miles of new 30-inch diameter pipeline looping in two sections across Michigan and Wisconsin, addition of one 12,500-horsepower and one 3500-hp compressor unit. Environmental impact would occur with respect to effects on man, wildlife, vegetation, soil, water quality, air quality, and noise quality.

31534 (DOE/EIS—0072-F(Vol.3)) **Final environmental statement: Great Plains Gasification Project, Mercer County, North Dakota.** (Department of Energy, Washington, DC (USA). Assistant Secretary for Environment). Aug 1980. 233p. NTIS, PC A11/MF A01.

This Final Study is divided into two parts. Part 1, Revisions to Draft Study, is arranged by major subject area (animals, vegetation, social conditions, proposed action, alternatives, etc.). Part 1 includes all changes resulting from public comments or internal reevaluation. Some of these changes are substantial. Part 1 also includes minor technical and editing corrections, clarification, modifications, new information, and revised visuals. Part 2, Response to Public Comments, is arranged by comment followed by response. Some duplication is caused by letters which accompanied verbal testimony. Some of the notable changes in Part 1, or clarification in Part 2, as a result of public comments included: (1) major reassessment of air quality related to the Clean Air Act Amendments of 1977, and other major additions to the climate and air quality sections. (2) Economic and population growth in Stark, Billings, and Dunn Counties. (3) Clarification on state exclusion and avoidance areas for surface mining. (4) Additional information on surface owner consent. (5) Trends in surface owner choices of reclamation. (6) Natural Gas Pipeline Company project status. (7) Social attitudes research methodology. (8) Recent oil and gas development in Stark, Dunn, and adjacent counties. (9) Endangered species. (10) Mined land reclaimability. (11) Public health.

31535 (PB—297618) **Health and environmental effects of coal gasification and liquefaction technologies. A workshop summary and panel reports.** Brown, R.; Witter, A. (ed.). (Mitre Corp., McLean, VA (USA). METREK Div.). May 1979. Contract AC01-79EV10018. 380p. (DOE/HEW/EPA—03; MTR—79W00137). NTIS, PC A17/MF A01.

In his 1977 Environmental Message, President Carter directed the Secretary of Energy, the Secretary of Health, Education and Welfare, and the Administrator of the Environmental Protection Agency to establish a joint program to identify the health and environmental problems associated with advanced energy technologies and to review the adequacy of present research programs. This report is the result of a workshop to address the health and environmental effects of coal gasification and liquefaction technologies held in Leesburg, Virginia, from August 20 to 25, 1978. Throughout the workshop, attendees participated in six panels: occupational and public health and safety; air quality; water quality, water quantity, and aquatic ecology; errestrial effects; ambient measurement and monitoring; and source characterization. This report contains a presentation of the highlights of the issues considered by the panels and the panel reports, which contain specific information on environmental and health effects, information requirements, and detailed research statements. Lists of participants and support staff are provided in the Appendix. This report on coal gasification and liquefaction technologies responds to the first part of the President's directive - to identify health and environmental problems. The requisite research information needs associated with these problems will be compared with present Federal research programs in another report, a synthetic fuels summary, which will relate the priority of health and environmental research requirements of both oil shale and coal gasification and liquefaction technologies to ongoing research. The results of these reports and other products of the Interagency Committee should provide a basis for strengthening the Federal program for ensuring safe and timely development of our energy resources.

31536 **Toxicity and toxic interaction of aniline and pyridine.** Schultz, T.W.; Allison, T.C. (Pan American Univ., Edinburg, TX). Contract W-7405-ENG-26. *Bull. Environ. Contam. Toxicol.;* **23**: No. 6, 814-819(Dec 1979).

Chemical characterization of organic contaminants of coal conversion processes such as gasification or liquefaction has revealed them to be a potential source of environmental hazards. The majority of these compounds may be divided into four major classes: (1) phenols, (2) aromatic hydrocarbons, (3) aromatic amines, and (4) sulfur-containing compounds. Little is known about nitrogen-substituted aromatics. The data available, however, suggest that they are toxic and, even more importantly, are resistant to structural degradation. Examination of their water solubility reveals that although they are not as soluble as low-molecular-weight phenols, arylamines are more soluble than their nonsubstituted or sulfur-containing analogs. Thus, with existing technologies there is a real possibility that nitrogen-containing aromatic compounds may be discharged from coal conversion facilities as aqueous effluent in large enough concentration to have a pemicious effect on aquatic biota. Acute toxicity thresholds of several nitrogen-containing aromatic compounds have been tabulated for aquatic organisms, but potential toxic interactions between these compounds have not been investigated.

RESERVES AND EXPLORATION

REFER ALSO TO CITATION(S) 31554, 31590

31537 (CONF-800759—1) **PEAT: an energy alternative.** Schora, F.C.; Punwani, D.V. (Institute of Gas Technology, Chicago, IL (USA)). 1980. Contract AC01-76ET10283. 29p. NTIS, PC A03/MF A01.

From Energy in the third world conference; Vienna, Austria (28 Jul 1980).

Even though peat is a low-heating value and low-bulk density fossil fuel which in its natural state contains over 80 percent moisture, it can be an economical alternative to coal, and fuel oil, as is the case in Iceland and Finland for direct combustion applications. This is because of the relative ease with which peat can be harvested, and the generally low sulfur and ash content of peat. Recent studies show that peat also has very favorable characteristics for conversion to synthetic fuels. Tests show that on the basis of chemistry and kinetics, peat is a better raw material than coal for production of synthetic fuels. Recent estimates also show that conversion of peat to high-Btu gas (>950 Btu/scf) is competitive with other alternatives of synthetic high-Btu gas. Therefore, peat can be an economical energy alternative depending upon location of peat deposits, region of energy need, scale of operation and cost of other energy alternatives.

31538 (DOE/ET/10283—T1) **Peat as an energy alternative.** Punwani, D.V. (Institute of Gas Technology, Chicago, IL (USA)). Jul 1980. Contract AC01-76ET10283. 10p. NTIS, PC A02/MF A01.

The importance of developing alternative energy sources to augment supplies of fossil fuels is growing all over the world. Coal, oil shale, tar sands, biomass, solar, geothermal, nuclear, and hydroelectric power have received considerable attention as alternative energy sources. One large energy resource, however, has received little attention until recently. That resource is peat. Although peat is used as an energy source in some countries such as Russia, Ireland, and Finland, it is virtually unexploited in many countries including the United States. This paper provides an understanding of peat: its varieties, abundance, and distribution; its value as an energy alternative; its current and future role as an energy alternative; and the environmental and socioeconomic impacts of large-scale peat utilization.

31539 **Western low-rank coal development analysis.** Gronhovd, G.H. (Dept. of Energy, Grand Forks, ND); Sondreal, E.A.; Kotowski, J.A.; Wiltsee, G.A. *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 199-209(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

An analysis of the technical, environmental, and economic constraints to expanded development of the US, low-rank coal resource is in progress. The primary objective is to propose a comprehensive national R and D program focusing on technology development for enhanced utilization of lignite and subbituminous coal. Utilization of these fuels has expanded rapidly in recent years and will continue to expand in line with national energy priorities. This will require technological improvements and developments to solve unique problems associated with the physical and chemical properties of low-rank coals. These properties include high moisture content, dispersed alkaline mineral matter content, high reactivity, and low sulfur content. The study is being directed by the Grand Forks Energy Technology Center (GFETC), which has the lead mission within the Department of Energy for technology applications for low-rank coals. To fulfill this assignment, GFETC must: (1) identify the properties of low-rank coals that affect the applicability and economics of technologies; (2) identify R and D needs unique to low-rank coals, and establish priorities based on potential impact on expanded development; and (3) ensure that DOE's coal R and D programs address those needs. Historically, GFETC has focused on lignite R and D, primarily on Northern Great Plains lignite. This has included programs in coal combustion, preparation, liquefaction, gasification, and environmental control technologies. The Center has also sponsored a biennial lignite symposium, designed to encourage the transfer of low-rank coal technology data between government, industry, and academia. The present study was initiated as a means to identify other needed R and D areas associated with the whole spectrum of US low-rank coals.

MINING

REFER ALSO TO CITATION(S) 31515, 31516, 31517, 31539, 31596, 31600, 31602, 31609, 31610

31540 (ACIRL-PR—79-9) **Development and application of a computer modelling technique for assessment of the stability of under-**

ground mining layouts. Hebblewhite, B.K. (Australian Coal Industry Research Labs., North Ryde). 1979. 40p. Australian Coal Industry Research Labs., North Ryde.

A numerical method for analysing the stability of underground planer mining layouts has been developed in a joint research programme between ACIRL and CSIRO. The method, based on displacement discontinuity theory, is applicable to coal mine planning for evaluating particular mining methods and sequences. Recent developments incorporated in the programme (THREED), such as caving criterion, are described and results of a longwall development trial problem is outined and an operating manual for the programme is included in the Appendix.

31541 (AESD-TME—3030) **System safety report for methane utilization from coalbeds for power generation at Bethlehem Mines Corporation, Marianna Mine No. 58, Marianna, Pennsylvania.** (Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Energy Systems Div.). Jul 1980. Contract AC05-77ET13133. 57p. NTIS, PC A04/MF A01.

Since the inception of this program, the engineering effort has been directed towards designing in safety features instead of reviewing them in. This was accomplished by identifying the hazards associated with the coalbed gas mixture program and then specifying equipment, systems and procedures that would eliminate, control or provide early warning of these potential hazards. The system safety was also enhanced by specifying or selecting proven equipment from known vendors and by adhering to the requirements of established safety codes and criteria. No part of this system was considered beyond the state-of-the-art. Flammable gases are compressed safely every day and there are many installations of turbine-generator units running on liquid fuel or natural gas. Even while selecting known equipment though, engineering still incorporated additional safety features to further increase the system's overall safety. As the primary potential hazard of this program is in the utilization of a methane-air mixture, which in the percentage range of 5 to 15 percent is highly flammable, the major system safety engineering effort has been directed towards this mixture's safe control. It can be utilized safely by not allowing it to approach its limits of flammability until it is in the turbine system and by controlling extraneous sources of ignition.

31542 (AESD-TME—3031) **Environmental impact assessment for methane utilization from coalbeds for power generation at Bethlehem Mines Corporation, Marianna Mine No. 58, Marianna, Pennsylvania.** (Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Energy Systems Div.). Jul 1980. Contract AC05-77ET13133. 47p. NTIS, PC A03/MF A01.

This project will be conducted at the Sabol Shaft which is located outside Marianna, Pennsylvania, in Washington County. This project has its objective, the successful demonstration of an existing gas turbine/generator assembly adapted to a methane (CH_4) fuel source. The gas normally vented to the atmosphere prior to a mining operation can be used as a fuel source to drive the gas turbine/generator assembly to produce electrical power. This power can then be fed back to the mining operation which reduces the dependence of the mine on electrical power supplied by the utilities company. The fuel source in this project is the Waychoff Borehole, Marianna No. 58 Mine, of Bethlehem Mines Corporation. The gas turbine/generator assembly is portable and mounted on a trailer van. Thus when the fuel source has been depleted, the installation can be moved to another site location for subsequent use. The relatively small size of the system and rural location combine to minimize the environmental impact. The installation will not have any impact on any threatened or endangered species of wildlife or vegetation. Discharges to the atmosphere will be gaseous since the fuel is a gas. The system does not utilize water or solid fuel; therefore, there will be no liquid or solid discharge. The turbine/generator assembly is enclosed within a trailer and thereby minimizes the increase in ambient noise.

31543 (DOE/EIA—0125-2Q79) **Bituminous and subbituminous coal and lignite distribution, January-June 1979. Energy data report.** (Department of Energy, Washington, DC (USA). Energy Information Administration). 26 Oct 1979. 94p. NTIS, PC A05/MF A01.

Coal produced and purchased during January-June 1979 totaled 373.7 million tons. 368.4 million tons was shipped for consumption while 5.2 million tons was stockpiled. 337.4 million tons went to consumers in the United States and 31.0 million tons was exported (7.9 million tons to Canada and 23.1 million tons to Mexico and destinations overseas). In the USA 262.4 million tons went to electric utility plants, 40.0 million tons went to coke plants, 33.4 million tons went to industrial users (other than coke), and a total of 0.9 million tons was distributed for retail sales. Of the 7.9 million tons shipped to Canada, 4.5 million tons went to electric utility plants, 3.1 million tons went to coke plants, 0.2 million tons went to industrial users, and a total of 0.04 million tons was snipped for retail sales. Railroads, the principal mode of coal transportation, hauled 179.0 million tons or 49 percent of the 368.4 million tons of coal distributed in the first six months of 1979. River transportation ranked second with 55.0 million tons or 15 percent followed by truck shipments with 52.7 million tons or 14 percent. Figure 3 shows shipments of coal for United States consumption by supplying area and transportation mode.

31544 (DOE/MC/08089—T12) **Methane recovery from coalbeds project. Monthly progress report.** (TRW, Inc., McLean, VA (USA). Energy Systems Planning Div.). Jun 1980. Contract AC21-78MC08089. 104p. NTIS, PC A06/MF A01.

Projects in various areas are described briefly. (LTN)

31545 (NP—25004) **National Coal Board report and accounts, April 1, 1979-March 29, 1980.** (National Coal Board, London (UK)). 1980. 98p. NTIS (US Sales Only), PC A05/MF A01.

1979/80 was a year of achievement for the UK coal industry. After a difficult year in 1978/9, the industry recovered strongly: deep-mined output was up by nearly 4 million tonnes - the first increase since 1963; output per man rose by 5%; sales were nearly 10 million tonnes higher; the number of fatal accidents was 30, the lowest figure ever, and the overall casualty rate was lower as well; and financial objectives were achieved. A high level of sales was achieved, and sales to power stations reached the record level of 85 1/2 million tonnes. Coal generated nearly three-quarters of the nation's electricity and increased its market share by 5%, in place of oil. The coke market was disappointingly weak and sales to this market fell, partly because of the protracted steel strike. The Board have been discussing with the Government a new financial framework for the industry for the next five years. This framework is embodied in the new Coal Industry Bill which is designed to ensure that the Board's capital investment programme continues as vigorously as possible and that the industry is profitable, while at the same time substantially reducing Government financial aid over the next three years. The Board are confident of coal's long-term future but do not wish to make light of the tremendous difficulties that will be involved in meeting the Government's financial objectives, which were negotiated before the onset of the recession. The coal industry is too large and too complex to be able to change rapidly, and in responding to the challenge, the Board hope the Government will provide them with a measure of short-term flexibility, particularly in regard to the treatment of coal stocks, which can have a disproportionate effect on the cash situation. The financial objectives agreed with Government were in fact achieved in 1979/80.

TRANSPORT AND HANDLING

REFER ALSO TO CITATION(S) 31489, 31526, 31543

31546 (IS-M—275) **Status of chemical coal cleaning processes.** Wheelock, T.D. (Ames Lab., IA (USA); Iowa State Univ. of Science and Technology, Ames (USA). Dept. of Chemical Engineering). 1980. Contract W-7405-ENG-82. 21p. (CONF-800910—1). NTIS, PC A02/MF A01.

From 5. international conference on coal research; Dusseldorf, F.R. Germany (1 Sep 1980).

A number of chemical coal cleaning processes have been investigated. These processes are quite varied with respect to the chemical reactions involved, operating conditions employed, effect on coal properties, by-products and wastes produced, and results achieved. Most of the processes will remove 90% or more of the inorganic forms of sulfur from coal and several will remove part of the organic form of sulfur as well. Many of the processes will reduce the ash content of coal significantly and some will extract a number of the trace elements. Also some of the processes will add oxygen or other elements to the coal, some will remove hydrogen or volatile matter, and some will alter the caking and swelling properties of coal. Even though all of these processes are designed primarily to produce clean fuel for use in direct combustion, some may find application in preparing coal for gasification or other uses because the treated coal is more reactive or has less tendency to cake. While many of these processes seem promising, none are fully developed, and projected plant capital and operating costs are high. None of the processes appear to have been demonstrated in a fully integrated pilot plant encompassing all of the steps in any given process. On the other hand, the principal desulfurization step of every process has been demonstrated experimentally. It is apparent that considerably more work remains to be done before any of these processes reach the commercial plant stage. In general, process conditions need to be optimized, the removal of organic sulfur improved, the regeneration of spent leaching solutions or other treating agents demonstrated, and methods of waste disposal tested.

31547 **Removal of sodium from lignite by ion exchanging with calcium chloride solutions.** Paulson, L.E.; Futch, J.R. (Dept. of Energy, Grand Forks, ND). *Am. Chem. Soc., Div. Fuel Chem., Prepr.;* **25**: No. 1, 224-232(1979). (CONF-800303—P4).

From 179. national meeting of the American Chemical Society; Houston, TX, USA (23 Mar 1980).

The quantity of sodium removed from lignite by ion exchange with calcium is a function of the coal's moisture content, particle size, quantity of calcium present in solution, solution temperature and contact time. The greatest exchange occurred with lignite containing more than 28% moisture and smallest particle size (80 mesh x 0). The rate of exchange increases slightly with temperature to 120°F. The sodium removal is a direct function of solution calcium concentration. Solution concentration and solid-liquid ratio are interdependent variables which determine total quantity of calcium which contacts a unit quantity of lignite.

COMBUSTION

REFER ALSO TO CITATION(S) 31459, 31476, 31486, 31525, 31529, 31530, 32423, 32679, 32708, 32709

31548 (ANL/CEN/FE—79-15) **Investigation of limestone sulfation enhancement agents and their corrosion rates in FBCs. Annual report, October 1978-September 1979.** Johnson, I.; Myles, K.M.; Lenc, J.F. (Argonne National Lab., IL (USA)). 1979. Contract W-31-109-ENG-38. 109p. NTIS, PC A06/MF A01.

This work supports the development studies for atmospheric and pressurized fluidized-bed coal combustion. Laboratory studies and runs in an atmospheric process-development-scale combustor are aimed at providing information on the effects of water addition and chemical additives such as $CaCl_2$, NaCl, and Na_2CO_3 on (1) the degree of sulfation of limestone sorbent at various operating conditions and (2) the corrosion of candidate materials for fluidized-bed coal combustion facilities.

31549 (ANL/ECT/TM—1) **Status of combustion-modification technology for utility-boiler NO/sub x/ control.** (KVB, Inc., Irvine, CA (USA)). Dec 1978. Contract W-31-109-ENG-38. 89p. NTIS, PC A05/MF A01.

This report documents significant developments in the subject area of combustion modifications as applied to coal-fired utility boilers. The primary emphasis is on the status of NO/sub x/ control technology, but related topics, such as boiler corrosion and hazardous emissions during modified-combustion operation, are also discussed. This report is intended as a complement to the 1977 Assessment of NO/sub x/ Control Technology for Coal-Fired Utility Boilers (ANL/ECT-3, Appendix D). A synopsis of recent NO/sub x/ field-test programs undertaken by the U.S. Environmental Protection Agency (EPA) and the Electric Power Research Institute (EPRI) is presented along with a status report on the major boiler manufacturers' low-NO/sub x/ burner/boiler development efforts. Because of concerns that low-NO/sub x/ operating modes may increase boiler-tubewall corrosion and increase polycyclic-organic-matter (POM) and SO_3 emissions, discussions of recent test programs and analytical studies on these topics are also included.

31550 (CONF-800838—1) **Model for attrition in fluidized beds.** Chen, T.P.; Sishtla, C.I.; Punwani, D.V.; Arastoopour, H. (Institute of Gas Technology, Chicago, IL (USA)). Feb 1980. Contract AC02-77ET26926. 9p. NTIS, PC A02/MF A01.

From International fluidization conference; Henniker, NH, USA (3 Aug 1980).

A model has been developed to predict the particle size distribution and amount of fines generated during the attrition of particles in fluidized beds. The model agrees well with the experimental data and shows the potential for scale-up.

31551 (DOE/ET/10379—T1) **Industrial application fluidized bed combustion. Category III: indirect fired heaters. Quarterly technical report No. 16, April 1-June 30, 1980.** (Exxon Research and Engineering Co., Florham Park, NJ (USA). Engineering Technology Dept.). 1980. Contract AC01-76ET10379. 42p. NTIS, PC A03/MF A01.

The High Temperature Heat Flux Test Unit was put into operation during July 1979. Tests using both propane and coal fuels have been completed. Test results are summarized in this report. The object of the Economic and Applications Task of the Program is to evaluate the economic and logistic factors that might influence the schedule and circumstances under which coal fired Atmospheric Fluidized Bed Combustion (AFBC) technology might be applied to petroleum and petrochemical plant process heaters. The results of these studies indicate that the potential for near term application of AFBC technology to refinery crude heaters is relatively low. A possible alternative application of FBC heaters in the Exxon Donor Solvent Process for the liquefaction of coal has been identified. In this alternative an FBC heater would be used to burn the heavy vacuum tower bottoms. A preliminary design of such a heater has been completed and released to the Exxon Synfuels Division for further evaluation. The final task of the program will be to prepare a design specification for a hypothetical commercial sized process heater from which all interested parties can make a definitive evaluation of the technical and commercial prospects of the technology. This design work is now underway.

31552 (FE—5490-7) **Electrostatic granular bed filter development program. Quarterly technical report, April-June 1980.** Boericke, R.R. (General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.). 10 Jul 1980. Contract AC01-79ET15490. 20p. NTIS, PC A02/MF A01.

A preliminary study of the integration of an Electrostatic Granular Bed Filter into the General Electric PFB Reference Plant has been completed. Initial estimates of filter media required for the EGB filter indicate that spent dolomite from the PFB will not be satisfactory. An alternate concept using pea gravel as the filter media has been evaluated. The higher face velocities possible with pea gravel will reduce both the size and number of EGB filters required. The filter media required by the EGB filter for 99.5% efficiency will range from a minimum of 10 lb media/lb dust to a maximum of 25 lb media/lb dust; the actual requirement will be determined by test. Assuming a combined cyclone stage efficiency of 91%, the plant filter media required at the 25 to 1 ratio is 300,000 lb/h for 15% ash coal and 238,000 lb/h for 9.6% ash coal. At a 10 to 1 ratio, the media required will range from 120,000 to 95,000 lb/h as the ash content varies. At rated conditions, the dolomite feed rate is 173,000 lb/h and plant coarse offtake is 87,000 lb/h, which is reduced to 34,720 lbs/h after sieving at 10 mesh. Thus, there is not enough spent dolomite greater than 10 mesh generated by the plant to serve as cleaning media in the EGB filter. In addition, the dolomite would have to be cooled before sieving and then reheated upon entering the EGB filter. This heat loss would reduce cycle efficiency, although this has not been quantified. In contrast, the pea gravel can be cleaned and recirculated without appreciable heat loss. The recommended alternative to spent dolomite as a filter media is pea gravel, with a diameter ranging from 1/8" to 1/4". Ash would be separated from the gravel in a pneumatic conveyor and the gravel recycled while the ash would be collected in a baghouse.

MARKETING AND ECONOMICS

REFER ALSO TO CITATION(S) 31543

31553 (JPL-PUBL—79-72) **Conference and workshop on coal use for California. Coal use for California: problems and perspectives. Final report.** Goldsmith, M. (Jet Propulsion Lab., Pasadena, CA (USA)). 30 Jun 1979. Contract AA01-78ET12276. 90p. NTIS, PC A05/MF A01.

Coal has not been a major factor in energy supply in California. Both Federal law and policy statements by state leaders indicate that coal will assume an increased role in the future. A conference, with invited papers, was held in May 1978, to review technical, economic, legal and social aspects of the use of coal for California. This was followed by a smaller scale workshop, held in October 1978. Technical and policy issues were identified in those activities, and conference and workshop reports have been prepared. A series of discussions and interviews between JPL staff and policy-oriented individuals were held to clarify issues and to explore possible solutions to problems. This report is a record of the results of this work.

31554 **Coals and coal-bearing rocks of the Hanna Coal Field, Wyoming.** Glass, G.B.; Roberts, J.T. Laramie, WY; Geological Survey of Wyoming (1980). 52p. (DOE/TIC—11226).

Renewed interest in Wyoming's vast coal deposits began in the late 1960's as power plant demands for inexpensive, low sulfur coals increased. Because of this demand, Wyoming's coal companies have set new production records every year since 1972. Table 1 summarizes annual production for the last 19 years on a county basis. Wyoming's 1978 tonnage set yet another record at 58.2 million tons. With this tonnage, Wyoming remains the largest coal-producing state in the Rocky Mountains and the fourth largest in the nation. Coal production in Wyoming was dominated by underground mining until 1954. In that year, strip mining tonnage barely exceeded that of the underground mines. Since then, however, strip mining has become the dominant mining method and now accounts for about 99 percent of Wyoming's annual production. Conversely, underground mining has slipped to approximately one percent of the annual tonnage mined. In 1978, twenty-one coal mining companies produced 58.2 million tons of coal. These companies operated 22 strip mines and 3 underground mines.

31555 **Division of Mines report.** Columbus, OH; Department of Industrial Relations (1978). 128p. (NP—24976).

This annual report of the mining industry of Ohio presents production statistics, employment and wage date, and other pertinent information of value not only to the industry itself, but also to existing companies contemplating expansion, and new companies seeking to relocate. There were three less fatalities in the mining industry for 1978 than there were in 1977. The coal mining industry had a total of four - two underground and two strip. Industrial

minerals had a total of one in sand and gravel. While production in the industrial minerals increased, and coal production decreased with value and wages in all segments remaining near the same. The report provides comprehensive statistical data regarding Ohio's mining industry.

HEALTH AND SAFETY

REFER ALSO TO CITATION(S) 31501, 31520, 31535, 31555, 32870, 32871, 32877

REGULATIONS

REFER ALSO TO CITATION(S) 31530

PETROLEUM

REFER ALSO TO CITATION(S) 31452

31556 (DOE/BETC/QPR—79/4) **Liquid fossil fuel technology. Quarterly technical progress report, October-December 1979.** (Department of Energy, Bartlesville, OK (USA). Bartlesville Energy Technology Center). Apr 1980. 56p. NTIS, PC A04/MF A01.

Activities and progress are reported in: liquid fossil fuel cycle, extraction (enhanced recovery of oil and gas), processing (of petroleum and alternate fuels), utilization (transportation and energy conversion), and systems integration. BETC publications and finances are listed in appendices. (DLC)

RESERVES

31557 (UT/CES-PS—11) **Offshore oil: an overview.** Manners, I.R. (Texas Univ., Austin (USA). Center for Energy Studies). Jun 1980. 115p. NTIS, PC A06/MF A01.

This report provides an assessment of the current status of offshore activity with particular reference to (1) trends in offshore production, and (2) the intensity and location of exploration drilling, this being an essential precondition for any future increase in offshore crude production. The report includes in-depth profiles of those non-OPEC nationa where the chances of discovering further recoverable offshore reserves appear highest. The underlying concern is to identify those nations that are on the offshore frontier. It is these nations that must resolve in an appropriate and timely manner the particular policy issues that arise in the course of offshore oil exploration and production. These issues include (1) the development of appropriate, risk-free offshore technologies, and (2) balancing of conflicting and competing demands for land (recreational use, wetland preservation, siting of infrastructure and energy-related facilities) in the coastal zone. In these respects, the exploitation of offshore oil and gas poses a unique form of challenge.

31558 **Resource appraisal and the effect of price and technology.** Uri, N.D. (DOE, Washington, DC). *Environ. Sci. Technol.;* **14**: No. 3, 283-287(Mar 1980).

This paper estimates the cumulative level of discovery and production of crude oil in the United States. Two functional specifications are suggested and estimated. 11 refs.

GEOLOGY AND EXPLORATION

REFER ALSO TO CITATION(S) 32871, 32874

31559 **Salem limestone oil and gas production in the Keenville field, Wayne County, Illinois.** Stevenson, D.L. Urbana, IL; Illinois State Geological Survey (1978). 18p. (NP—25033).

Oil has been produced from the Salem Limestone of Valmeyeran (middle Mississippian) age in Illinois since 1939. In 1972 the discovery of Salem oil at Zenith North field in Wayne County, Illinois, stimulated a resurgence of Salem exploration in the Illinois Basin. By the end of 1977, activity had resulted in 3 new field discoveries and 24 new pool discoveries in the Salem of Illinois. One of the most promising of these discoveries was in the Keenville field in T. 1 S., R. 5 E., Wayne County, Illinois. The discovery well was completed early in January 1977, and by the end of the year 40 wells had produced approximately 760,000 barrels of Salem oil. The oil is produced from a biocalcarenite (predominatly sand-sized fossils and fossil fragments), with highly variable porosity and permeability, which lies about midway between the top and bottom of the formation. No structural closure is evident on key marker beds above the Salem, but some closure is created by the tendency of the producing zone to occur increasingly lower in the section in an up-dip direction. Water-free oil production was obtained in many wells by setting pipe through the reservoir and perforating above the oil-water contact, as determined by examination of drill cuttings. The oil produced is accompanied by gas with a heating value of about 1500 Btu/ft^3. To date, most of the oil accumulations in the Salem have been found by drilling below shallower, producing zones on prominent structures. The presence of reservoirs within the Salem, such as the one at Keenville has been difficult to predict prior to drilling. The recent increase in the number of holes drilled to or through the Salem should add to our knowledge of its depositional and diagenetic history and help in further oil exploration.

31560 **Prediction of Silurian reef locations through trace elements profiles.** Cahill, R.A.; Schleicher, J.A.; Meents, W.F.; Liu, C.L.; Ruch, R.R. Urbana, IL; Illinois State Geological Survey (1978). 28p. (NP—25032).

This investigation studies the use of certain trace element concentrations as geochemical indicators to distinguish between reef and nonreef material in southern Illinois carbonates. In addition, geochemical criteria were used to predict the distance of a sample from a reef. Thirty-two elements were determined on 63 Silurian rock samples grouped according to their locations. With the use of a discriminant analysis function, 50 of the 63 samples were correctly classified. This method has potential for predicting the locations of unknown reefs and possible petroleum accumulations.

DRILLING AND PRODUCTION

REFER ALSO TO CITATION(S) 31559, 31605, 32710, 32782

31561 (CONF-800739—1) **Scleroglucan biopolymer production, properties, and economics.** Compere, A.L.; Griffith, W.L. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01.

From 6. international fermentation symposium and 5. international symposium on yeasts; London, Ontario, Canada (20 Jul 1980).

Production and solution properties which may make scleroglucan polysaccharide economically advantageous for onsite production and use in tertiary oil recovery were investigated. Scleroglucan, which is similar in viscosity and shear thinning to xanthan, can be produced in a 3-day batch or 12 h continuous fermentation. Yield is nearly 50% based on input glucose. Gross biopolymer-biomass separation may be effected using microscreening, a low energy process, followed by polish filtration. Polymer flux may be improved by hydrolysis with an endolaminarinase from Rhizopus arrhizius QM 1032. Simple feedstock requirements and low growth pH, together with the difficulty of resuspending dried polymer, may encourage field biopolymer fermentation and use of purified culture broth.

31562 (DOE/BC/10027—11) **Analysis of reservoir pretreatment in chemical flooding: a literature review.** Surkalo, H.; Pouska, G. (Exoil Services, Golden, CO (USA)). Jul 1980. Contract AC19-79BC10027. 173p. NTIS, PC A08/MF A01.

This paper is a state-of-the-art literature review on preflush for chemical flooding. A preflush can result in reduced surfactant consumption, improved slug performance, and/or increased reservoir contact. Chemical and physical processes which may occur during a preflush injection include the following: reduction in surfactant adsorption on reservoir clays, reduction in surfactant precipitation due to multivalent cations, and added mobility control to improve reservoir sweep efficiency. Reduction of sulfonate losses has clearly been found to be the most frequently identified purpose of a preflush. This goal is accomplised by means of fluid displacement, cation exchange, or other sacrificial replacement process. The literature review shows the laboratory studies to be the most valuable source of current technology. Field studies completed to date provide less up-to-date information presumably because of the greater time lag associated with a field project. The patents proved to be the least important source of information. 83 references.

31563 (DOE/BETC/OR—12) **Ion exchange characteristics of enhanced oil recovery systems: miscibility studies. Biennial report for the period April 1, 1977-March 30, 1979.** Ho, P.C.; Kraus, K.A.; Johnson, J.S. Jr.; Lietzke, M.H.; Thomas, M.M.; Ogden, S.B.; Burnette, R.G.; Hydzik, R.J. (Oak Ridge National Lab., TN (USA)). Aug 1980. Contract W-7405-ENG-26. 73p. NTIS, PC A04/MF A01.

Results are presented on the effect of NaCl concentration on solubility of alkyl benzene sulfonates in water; effect of alkyl benzene sulfonate concentration on miscibility of a selected hydrocarbon, toluene, with water; effect of alkyl substitution on alkyl benzene sulfonates on miscibility; analogous effects of alcohol required to produce miscibility between toluene and an aqueous solution of an alkyl benzene sulfonate at a given concentration for different hydrocarbon/aqueous ratios; the effect of number of alkyl carbons, both in alkanes and in alkyl benzenes, on miscibility with a selected aqueous

alkyl benzene sulfonate; and miscibilities of similar systems with mixtures of hydrocarbons. At a given protosurfactant concentration, increase in alkyl substitution on the alkyl benzene sulfonate or carboxylate increased solubilization of a hydrocarbon in the aqueous phase; in systems containing a cosurfactant, amounts of alcohol necessary to effect miscibility decreased with alkyl substitution on the organic salt. For alkyl benzene sulfonates substituted with up to four alkyl carbons, different isomers had essentially the same effect on miscibility at a given concentration; at higher degrees of substitution, differences were significant, though small. Higher concentrations of protosurfactants in most cases increased miscibility. Increasing the number of alkyl carbons of the hydrocarbon, either alkanes or phenyl alkanes, decreased miscibility. Alcohol requirements for miscibility were similar, but not identical, for alkanes and phenyl alkanes having the same number of alkyl carbons; whether more or less was required for the alkane or the corresponding phenyl alkane varied with the type of alcohol. Alcohol requirements for miscibility of hydrocarbon mixtures with aqueous protosurfactant solutions varied linearally with the weight fraction of the hydrocarbon components, other conditions being constant.

31564 (DOE/MC/8333—1) **Alternative concepts for supplying carbon dioxide for enhanced oil recovery projects. Final report.** Amirijafari, B.; Grange, F.; Ford, H.; Pforzheimer, T.; Williams, B. (Science Applications, Inc., Golden, CO (USA)). Jul 1980. Contract AM21-78MC08333. 156p. NTIS, PC A08/MF A01.

The objectives of a study of alternative concepts for supplying carbon dioxide for enhanced oil recovery (EOR) were to: define the CO_2 requirements for candidate EOR reservoirs; generate alternative concepts for collecting, transporting, storing and processing CO_2 from naturally occurring sources; compare the alternatives on the basis of cost effectiveness; reestimate the magnitude of the CO_2 EOR reserve base on the results of the above findings; and recommend future DOE program activities. These objectives were met, and conclusions derived from the study are given.

31565 (DOE/MC/03103—2) **Investigations of enhanced oil recovery through use of carbon dioxide. Progress report, July 7, 1978-December 31, 1979.** Whitehead, W.R.; Kimbler, O.K.; Hoshman, R.M.; Harvey, J.R. (Louisiana State Univ., Baton Rouge (USA). Dept. of Petroleum Engineering). Jun 1980. Contract AC21-78MC03103. 102p. NTIS, PC A06/MF A01.

Procurement, construction, and installation of unconsolidated sand packs and equipment for displacement studies up to 5000 psi is complete and the equipment is in routine use. One accomplishment was sampling equipment for taking samples at pressures up to 8000 psi during displacement and phase behavior studies. 21 displacements have been made using synthetic crudes. Results suggest that miscibility can be generated between pure CO_2 and this oil at 1100 psig. At a displacement temperature of 109°F, miscibility is generated through multiple contacts and the data suggest that the generation mechanism is one of condensation rather than vaporization. In displacements in which the injection gas was a CO_2-CH_4 mixture, the minimum miscibility pressure appears to increase approximately linearly with increasing methane content. Increased CH_4 concentrations over those originally present were observed in all displacements where the pressure was less than that required for first contact miscibility. Thus it was tentatively concluded that the presence of a bank is not in itself an indication that miscibility was not attained, but only an indication that the mechanism was one of generation of miscibility through mass transfer (multiple contacts).

31566 (MER—10.1(P-35)) **Mathematical solutions of parametric pulsed production of single phase flow through porous media.** Collier, R.S.; Monash, E.A. (Systems Technology, Inc., Paonia, CO (USA); Geological Survey, Denver, CO (USA). Conservation Div.). Jul 1980. 348p. Geological Survey, Denver, CO.

This monograph describes the analytic solutions of the extended reservoir per se model which is valid for any given equation-of-state; hence it covers solutions for any single phase fluid, liquid, or gas. Explicit solutions are given for arbitrary pressure dependent production rates and for time dependent sequences of pressure dependent rates (referred to as parametric pulsing of the reservoir). Moreover, the geometric rate function is identified which is a balance between the production rate and the rate of displacement by a water influx. The geometric rate function, g, occurs as a denominator of the solution integrals and hence the condition $g = 0$ describes a singularity condition of the fundamental equations. Separate singular solutions are obtained for this case which describe pressure maintenance of the system. The g function also describes accessible and inaccessible pressure ranges for the reservoir system; these may be obtained without finding the solutions explicitly. The singularities also define the terminal condition of the reservoir at thermodynamic exhaustion. Examples are given using the ideal liquid and the ideal gas (the standard reservoir per se model). Special production rates such as the constant rate, the pressure-squared rate and special pulsing cycles such as the exponential decline and identical pressure cycles are thoroughly and explicitly discussed showing graphs of the reservoir state variables and the reservoir production as a function of time.

31567 **Well collar or shoe and cementing/drilling process.** Davis, C.A. US Patent 4,175,619. 27 Nov 1979. Filed date 11 Sep 1978. 8p.

An improved well shoe or collar has at least one tooth protruding from the top of the cement shoulder of the shoe or collar capable of engaging, denting and penetrating a pump down wipe plug and retarding the tendency of the plug to rotate when engaged by a drilling bit, thereby enhancing the drilling action of a drill bit on a pump down wipe plug. An improved process of cementing within a well and drilling through a plug commenting within a well and drilling through a plug comprises inserting a pump down wipe plug at the interface of a fluid and wet cement, pumping the plug down the well until it comes into contact with a shoulder of a shoe or collar having at least one protrusion extending from the surface of the shoulder capable of engaging, denting and penetrating the plug, subsequently after the cement has set, lowering a drill bit onto the top of the plug, the protrusion retarding the tendency of the plug to rotate with the rotating action of the drill bit and enhancing the drilling action of the bit. 9 figures.

31568 **High vertical and horizontal conformance thermal oil recovery process.** Wu, C.H.; Brown, A.; Hall, W.L.; Shupe, R.D. (to Texaco Inc.). US Patent 4,175,618. 27 Nov 1979. Filed date 10 May 1978. 14p.

Thermal oil recovery processes employing the injection of steam and/or hot water for mobilizing viscous petroleum sweep only a small fraction of the formation between the wells because of override, underride, or channeling resulting in poor vertical conformance, as well as poor horizontal conformance of the swept portion of the formation. Both vertical and horizontal conformance are inproved significantly if steam is injected into a formation until channeling has begun, after which steam injection is terminated and an aqueous fluid is injected into the formation, which has a viscosity essentially the same as water and contains an emulsifying agent capable of forming a viscous emulsion in the portions of the formation where override, underride or channeling has occurred. After a small slug of emulsifying fluid has been injected, steam injection is resumed and as a consequence of the emulsion plug, moves into portions of the formation from which oil would not be recovered if the emulsion had not been injected. Multiple cycles of steam and emulsion injection may be applied to a formation to more completely sweep the full volume of the pattern. Surfactants suitable for use include organic sulfonates such as petroleum sulfonate, and solubilizing co-surfactants such as alkyl or alkylarylpolyethoxyalkylene sulfonates. 3 figures.

31569 **Oil development and production in Indiana during 1978.** Carpenter, G.L.; Keller, S.J. Bloomington, IN; Geological Survey (1979). 38p. (NP—25022).

Exploratory drilling activities for petroleum deposits in Indiana in 1978 are described. The names and locations of important wells are given. An historical record of oil production in Indiana from 1889 to 1978 is given. Oil field statistics for 1978 are tabulated. An appendix is included which lists oil fields arranged according to stratigraphic units. (DC)

31570 **Oil development and production in Indiana during 1977.** Carpenter, G.L.; Keller, S.J. Bloomington, IN; Geological Survey (1978). 36p. (NP—25062).

The drilling and production status of oil wells in the state of Indiana are discussed. The number of oil wells drilled in Indiana in 1977 is given. The status of each is described. Oil field statistics for 1977 are tabulated. The number of fields and their productivity from 1950 to 1977 in Indiana are given. Statistical data and maps are included. (DC)

PROCESSING

REFER ALSO TO CITATION(S) 31583, 32491, 32656

31571 (EMD—80-55) **How the petroleum-refining industry approaches energy conservation: a case study.** Staats, E.B. (General Accounting Office, Washington, DC (USA)). 13 Jun 1980. 71p. General Accounting Office, Washington, DC.

Report to the Congress of the United States by the Comptroller General.

The US petroleum-refining industry accounts for about 4% of total domestic energy consumption and over 10% of all energy consumed by the industrial sector. The Department of Energy reports that the industry has made significant strides in increasing its energy efficiency - reducing its energy requirements to refine a barrel of crude oil by 19.5% between 1972 and the end of 1978. Federal energy policies designed to raise domestic energy prices will have a large impact on refining-industry efforts to improve its energy efficiency. Federal programs aimed at improving energy

efficiency in industry have had little impact on the refining industry, but there are ways to improve these programs. Federal programs to increase substitution of coal for oil and natural gas also have had little impact on the refining industry and in some cases may actually be hampering efforts to improve energy efficiency. More must be done to demonstrate the feasibility of using coal-gasification technology in refineries.

31572 (LA-UR—80-1439) **Chemistry and processability of crude oil asphaltenes as studied by ultracentrifugation.** Weeks, R.W. Jr.; McBride, W.L. (Los Alamos Scientific Lab., NM (USA); Amoco Oil Co., Naperville, IL (USA). Research and Development Dept.). 1980. Contract W-7405-ENG-36. 31p. (CONF-800906—1). NTIS, PC A03/MF A01.

From National ACS meeting on chemistry of asphaltenes; Washington, DC, USA (Sep 1980).

From the number of crudes of this study, there appears to be a positive correlation between the total quantity of crude oil hetero atoms (S, N, Ni, and V) which are precipitated under conditions of ultracentrifugation and the degree of that particular crude's difficulty of hydroprocessing. Because of its powerful ability to separate colloidal material from suspensions and because of the known colloidal nature of asphaltenes, the ultracentrifuge was employed to effect the separation of crude oil constituents, and to thus provide information relating to the hydrocracking of resids. Asphaltenes vary greatly in their response to hydrocracking with some being remarkably refractive while others are readily destroyed. By studying the chemical nature of the asphaltene/colloid fractions, a correlation between this chemical constitution and processability was observed. The observation of Liesegang band-like phenomena is also reported along with chemical analyses of these bands.

31573 **Separating exchangers.** Cros, P.; Desorbay, J.P.; Refoubelet, J.J. (to Spie-Batignolles; Societe Generale de Techniques et d'Etudes). US Patent 4,174,273. 13 Nov 1979. Priority date 9 Sep 1975, France, 8p.

A method for heating crude oil to be processed in a petrochemical installation, comprises successive heat exchangers disposed in series, each heat exchanger using pressurized steam as the heating fluid. Each exchanger has a lower exchange chamber, a liquid product supply line and a tube bundle, the steam transferring heat to liquid product flowing through the tube bundle. Each heat exchanger comprises an upper separation chamber disposed above the lower exchange chamber, the separation chamber having a gas phase outlet and a liquid phase outlet, the liquid phase outlet being disposed lower than the level at which the tube bundle extends into the separation chamber. Successive heat exchangers are connected together by a pipe communicating between the liquid phase outlet of the upper separation chamber of one of the heat exchangers and the liquid product supply line of the next heat exchanger. The gas phase outlets of the successive heat exchangers are connected directly and independently from each other to the petrochemical installation, the liquid phase outlet of the last heat exchanger being connected to that installation. The steam for heating the heat exchangers is at a successively higher pressure, and hence a successively higher temperature, in the successive exchangers. (6 figures.)

31574 **Catalytic cracking of hydrocarbons.** Schwartz, A.B. (to Mobil Oil Corp.). US Patent 4,174,272. 13 Nov 1979. Filed date 13 Jun 1978. 26p.

Non-hydrogenative endothermic catalytic cracking of hydrocarbon, particularly petroleum, fractions at relatively low pressures and high temperatures in a system where the endothermic heat required for cracking is supplied by catalyst as the heat transfer medium, which catalyst has been heated by burning coke depostied on the catalyst during cracking; and wherein a decomposable compound of platinum, palladium, ruthenium, iridium, osmium, rhodium or rhenium, is introduced into contact with the cracking catalyst during said process. (3 figures, 2 tables.)

31575 **High severity reforming.** Mayes, W.W. (to Cosden Technology, Inc.). US Patent 4,174,271. 13 Nov 1979. Filed date 3 Nov 1977. 14p.

Disclosed is a process for the production of highly aromatic reformates in high yield from a naphtha feed fraction by high-severity catalytic reforming using a reforming catalyst which includes a hydrocracking promotor metal. The process comprises reforming the stock under conditions of high severity in a plurality of sequentially arranged reaction zones in which the concentration of the hydrocracking promotor metal of the reforming catalyst is adjusted to provide a minimal hydrocracking activity relative to the other reforming reactions to the catalyst in the first reaction zones, and an enhanced hydrocracking activity to the catalyst in the last reaction zones. The reformates produced according to this process are particularly useful in the blending of high aromatic content gasoline and/or in the production of high purity aromatic hydrocarbons.

PRODUCTS AND BY-PRODUCTS

REFER ALSO TO CITATION(S) 31587

HEALTH AND SAFETY

REFER ALSO TO CITATION(S) 32873

MARKETING AND ECONOMICS

REFER ALSO TO CITATION(S) 32401, 32402, 32403

31576 (DOE/EIA—0042/77) **International petroleum annual, 1977.** Southard, L.G. (Department of Energy, Washington, DC (USA). Energy Information Administration). 1 Jun 1979. 38p. NTIS, PC A03/MF A01.

Major developments which impacted the petroleum industry in 1978 are summarized. International petroleum statistics on 1977 crude oil production, world trade of petroleum and petroleum products, petroleum refining, and demand for refined petroleum products are presented. (DC)

31577 (DOE/EIA—0201/11) **Energy policy study. Volume 11. Federal pipeline regulation.** Berlin, B.P. (Department of Energy, Washington, DC (USA). Energy Information Administration). Aug 1980. 63p. NTIS, PC A04/MF A01.

The technical characteristics of natural gas and petroleum pipelines are such that, in the absence of Federal regulation, each pipeline company could possibly, according to traditional economic analysis, behave as a natural monopolist. Federal regulation of these pipelines probably has, therefore, generally resulted in slightly greater supplies of the delivered produce (at slightly lower prices) than would have occurred in the absence of those regulations. In addition to the cases of regulation and no regulation, two alternative forms of possible Federal pipeline regulation are presented. Specifically, regulation which would attempt to approximate a competitive solution could do so with the adoption of average cost pricing. This would result in some efficiency losses, since, at that output, marginal cost is less than price. To achieve maximum efficiency (i.e., maximum output for a given amount of inputs) the regulation would need to require marginal cost pricing. But since marginal cost pricing would result in losses for the firm, a subsidy would be needed for the firm to survive. On the other hand, regulation which would attempt to induce competition among pipelines would probably also result in efficiency losses, since pipelines competing in an area would necessrily be smaller than a more efficiently-sized monopoly; hence, the result would be higher prices and lower output than would result under the monopoly solution. If deregulation of the pipeline industries were to occur, the petroleum pipeline industry would probably enjoy fewer competitive gains from deregulation than the gas pipeline industry would. This would result because present oil pipeline regulations do not, unlike gas pipeline regulations, restrict entry and because oil pipeline regulations have produced unusually high rates-of-return on equity for the stockholders of those pipelines.

31578 (DOE/EIA—0215) **Secondary stocks: a paper prepared for the American Statistical Association Committee on Energy Statistics.** Kretz, J. (Department of Energy, Washington, DC (USA). Energy Information Administration). Jul 1980. 14p. NTIS, PC A02/MF A01.

Current concern primarily focuses upon the secondary stocks of home heating oil. This product, also called No. 2 heating oil and No. 2 diesel fuel is collectively referred to as No. 2 distillate. Secondary stocks are petroleum products held at bulk stations (storage facilities which do not qualify as bulk terminals), fuel wholesalers and retailers, and by consumers except private residential buildings and vehicles. Secondary stocks potentially contain a major reservoir of petroleum products within the country. As the price of petroleum products increases and as the nation becomes increasingly dependent upon imports, information demands from the public, Congress, and the Administration have increased. This demand for increasingly detailed information includes not only routine data collection from refineries and import facilities, but informatin on secondary and tertiary stocks. Beginning in early September 1979, EIA will be publishing a limited set of information on secondary stocks each month. In conjunction with the Bureau of Census, EIA has begun four new data collections. Bulk stations, fuel oil wholesalers, and fuel oil retailers as identified by SIC from the Standard Statistical Establishment List (SSEL) are being sampled and queried for information on monthly sales volume, inventory on site, and inventory owned and present within the country for each of the following product categories: No. 2 distillate (No. 2 heating oil and No. 2 diesel fuel); other distillate fuels (Nos. 1 and 4 heating and diesel, kerosene, and light gas enrichment oil); total distillate; and

residual oils. The purpose of this paper is to discuss new initiatives in collecting data dealing with secondary stocks of petroleum products.

31579 (DOE/EIA—0222) **Commercial and industrial storage of distillate and gasoline. A study required by Section 241 of the Emergency Energy Conservation Act of 1979.** Walton, H. (Department of Energy, Washington, DC (USA). Energy Information Administration). May 1980. 91p. NTIS, PC A05/MF A01.

This report presents information pertaining to the Emergency Energy Conservation Act (EECA) which was developed from surveys primarily initiated during the period EECA was being developed. Information is also provided from surveys, principally covering primary storage, (refineries, bulk terminals, and pipelines), which have been in existence for a number of years. Table 1 provides a list of those surveys used to provide information for this report. A supplementary report, to be published in six months, will provide newly developed data which substantially supplements the current information. This report, in conjunction with the up coming supplement and the National Petroleum Council (NPC) report, Petroleum Storage and Transportation Capacities, provide a detailed examination of petroleum storage at the primary and distributor levels. The NPC report focuses on primary stocks, whereas this report focuses on distributor, and some user, stocks.

31580 (DOE/EIA/06217—T1) **Cooperative agreement for No. 2 heating oil pilot price data collection: Vermont State Energy Office end of survey report.** (Vermont State Energy Office, Montpelier (USA)). 1978. Contract FC01-78EI06217. 5p. NTIS, PC A02/MF A01.

The State, through the Vermont State Energy Office in Cooperative Agreement with DOE implemented a weekly Pilot Survey Program for residential No. 2 heating fuel prices. The purpose of this survey program was to collect weekly price data, calculate the statewide average, submit the results weekly to S. J. Seymour, Chief of Energy Data DOE Region I, Boston and publish the average prices to the public and the news media. The methodology used in collecting data was a spinoff of our monthly price survey which has been in place since July 1974. The sample size of the survey was developed at that time and was extracted from a statewide list of heating oil dealers. The selection of dealers was random with approximately 3 or 4 selected from each of the 14 counties for a total of 46. No emphasis was given as to population and or the sales volume of dealers in those counties. The dealer survey was conducted by telephone. The price of No. 2 heating oil in the pilot survey was the posted retail price for residential consumers excluding any credit and or discount practices. Continuous communications with the consuming public regarding fuel prices provided us with an ideal cross-check for the data collected in our survey. This provided us with survey price data validation. All information received through the survey was held to be confidential and we continue to treat it in that manner.

31581 (DOE/EIA/10160—T1) **End of survey report: State of Rhode Island.** (Rhode Island State Government, Providence (USA)). 1979. Contract FC01-79EI10160. 15p. NTIS, PC A02/MF A01.

During the period November 1, 1978 through May 1, 1979, the State of Rhode Island conducted, by agreement with the United States Department of Energy Energy Information Administration (EIA), a price monitoring survey analysis for the average price of Number 2 heating oil. A weekly survey was conducted from 46 selected retail oil dealers, 8 refiners, and 7 jobbers for weekly rack price. A high and low price was designated and a weekly average computed. Subject prices were transmitted in writing and by telephone to the Department of Energy, Region One Office in Boston, Massachusetts. Survey showed November posting average to be $.535 cents/gal and incremented increase to $.675 cents/gal on May 25, 1979. As required by Cooperative Agreement, two copies of data on average heating oil pricing was submitted to the Department of Energy. Copies of reporting figures and data are attached. Survey conducted requisitioned data from retail dealers delivery - more than 70% of the total state supply. As a result, an excellent composite of pricing was identified and utilized by both State and Federal agencies.

31582 (DOE/EIA/10157—T1) **State of Maine Office of Energy Resources Weekly Price Monitoring System end of survey of report. 2nd annual report to Region I DOE.** (Maine Office of Energy Resources, Augusta (USA)). [nd]. Contract FC01-79EI10157. 42p. NTIS, PC A03/MF A01.

The OPEC oil embargo of 1973-1974 brought the nation to a realization of the importance and necessity for collection and analysis of energy data. The Maine Office of Energy Resources, (OER), has the responsibility to establish and implement energy policies in Maine. The Weekly Price Monitoring System, (PMS), has been developed and implemented to assist energy planners in Maine. This survey is used to analyze home heating oil price trends and as a public relations tool in response to inquiries from citizens, other federal, state and local agencies and the Governors Office. This report will describe the PMS and results obtained from this system during the period starting December 12, 1978 and ending June 4, 1979, (26 weeks). Also the price of home heating oil on November 1, 1978 is given as required in agreement number DE-FC01-79EI10157 between the US Department of Energy and the Maine Office of Energy Resources.

WASTE MANAGEMENT

31583 (DOE/BC/30227—1) **Review of all lubricants used in the US and their re-refining potential.** Bigda, R.J. (Bigda (Richard J.) and Associates, Tulsa, OK (USA)). Jun 1980. Contract AT19-78BC30227. 89p. NTIS, PC A05/MF A01.

The purpose of this handbook on lubricating oils and their use is to assist those persons in the waste oil collecting and recycling business. Uninitiated persons considering entering this business can get a better understanding of the waste oils and products of this industry from this handbook. The first two sections deal with the processing steps and ingredients of a lubricating oil and their functions. Understanding the fundamental difference between base stocks and additives is essential if the re-refiner is to make a quality product and avoid oils which cause difficulties. The remaining sections are discussions of specific types of lubricant products manufactured in the United States and information is presented about viscosity grades and typical formulations. This will enable a re-refiner to evaluate the potential base oil yields, the value of used oils and the nature of the base oil which can be recovered. The formulations, while not intended as a basis for actual finished product blending, can be used as a guide for preliminary planning. Data and forecasts regarding the consumption and amounts of each type of oil being collected are intended to provide collectors with realistic estimates of the quantities and qualities of oil available for recycling. This study also provides the collector with information on used oil sources, availability and contamination. The problems associated with the collection or handling of some of the products are discussed. There are hundreds of lubricants currently manufactured in the United States and several present difficult problems for a re-refiner. These problems can usually be converted into real opportunities if the re-refiner understands the products he is dealing with. The result is more profit for the re-refiner and improved conservation of a valuable resource.

ENVIRONMENTAL ASPECTS

REFER ALSO TO CITATION(S) 32796, 32805, 32820

31584 (AD-A—075763) **A scientific study to develop a practical method for assessing the cleanup of 'sour' (high sulfur) crude oil spills in littoral sands using benthic microorganisms. Final report.** Frankel, L. (Connecticut Univ., Storrs (USA)). 1979. Contracts D-27-79;4/79. 56p. NTIS, PC A04/MF A01.

The objective of this study was to determine if a practical method could be developed for assessing the cleanup of a single spill of Arabian Light Stabilized crude oil in littoral sands and gravels by using microorganisms as indicators. Crude oil was spilled on beaches at three localities along the Connecticut shoreline where different environmental conditions are present and the microbiota and sediments in oiled plots were compared with those in unoiled plots for up to 15 months. The study showed that microorganisms cannot be used as indicators of the effectiveness of cleanup operations in these sediments. Species diversity in the oiled and unoiled plots at each study locality was about the same throughout the study and, in general, only slight differences in the number of individuals were observed for most species. The spilled oil was rapidly removed from these sediments by natural processes. Retention was longest in the sediments that had relatively large amounts of organism produced mucilaginous materials. However, even in these sediments, the crude oil was not detected approximately three months after it was spilled.

31585 (DOE/EV/04995—T1) **National Spill Control School. A pilot program in environmental training. Final report.** Oberholtzer, G.R.; Acuff, J.T. (Corpus Christi State Univ., TX (USA). National Spill Control School). 1980. Contract AS05-76EV04995. 52p. NTIS, PC A04/MF A01.

Increased environmental awareness and the amended Federal Water Pollution Control Act of 1972 required an increased level of expertise by the American Public in the field of oil spill prevention and control. The National Spill Control School was created at Corpus Christi State University to help meet this need. Drawing on the talents of a nationwide sample of experts in this field, the project team created a unique management oriented course. A review of the origination and experiences of two years of classes of this pilot program is provided in this report.

POLICY, LEGISLATION, AND REGULATION

31586 (UT/CES-PS—10) **Petroleum and politics: the Texas Railroad Commission.** Prindle, D.F. (Texas Univ., Austin (USA). Center for Energy Studies). Mar 1980. 51p. NTIS, PC A04/MF A01.

This report discusses the policymaking traditions and political environment of the Railroad Commission of Texas, the state agency that regulates petroleum production, gas utilities, trucking, and commercial bus lines. It emphasizes the regulation of oil and gas production, the patterns of policymaking evident over the fifty years since 1930, and the political forces that may affect the Commissioners' policy choices. An expanded version of this report is in preparation for publication as a book entitled Petroleum, Politics, and Public Policy: The Texas Railroad Commission, 1930 to 1980. The present report is part of a continuing effort by the Center for Energy Studies to promote and conduct analyses that address policy implications of basic energy issues. Support for energy policy projects has been provided by foundation funds administered through CES.

PROPERTIES

REFER ALSO TO CITATION(S) 31572, 31731, 32782

31587 Polymer combination useful in fuel oil to improve cold flow properties. Wisotsky, M.J. (to Exxon Research and Engineering Co.). US Patent 4,175,926. 27 Nov 1979. Filed date 16 Jan 1978. 14p.

Ethylene polymers or copolymers, which are pour depressants for middle distillate fuel, in combination with a second polymer having alkyl groups of 6 to 18 carbon atoms, and derived from either dicarboxylic acid esters or olefins, are useful in improving the cold flow properties of middle distillate fuel oils wherein a portion, e.g., 5 wt. % or more, of the fuel boils above 700°F. 7 tables.

NATURAL GAS

REFER ALSO TO CITATION(S) 31452, 32455

RESERVES

REFER ALSO TO CITATION(S) 31557

31588 Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980). 373p. (CONF-800525—). Society of Petroleum Engineers.

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

The objective of the SPE and DOE in organizing this symposium has been to bring together in a single annual meeting the best of the professional community engaged in unconventional gas recovery technology. The first venture will focus on discussions of the realities and potentials of unconventional gas sources and an exchange of technology developments. Unconventional gas sources are expected to have an important impact on new gas supplies as technological developments rapidly emerge and become mature technologies in the recovery of natural gas from coal, tight formations, Devonian shale geopressured reservoirs and other alternative high-cost gas sources. It is hoped that this symposium will provide a state-of-art perspective on geology, exploration and production research, recovery technology and field test results. Separate abstracts have been prepared for individual articles for inclusion in the Energy Data Base.

GEOLOGY AND EXPLORATION

REFER ALSO TO CITATION(S) 31559, 31588, 31601

31589 Unconventional sources of gas. Chicago, IL; Institute of Gas Technology (1979). 31p. (NP—24465).

Possible sources for the production of natural gas are discussed. These include: black shales, coal seams, geopressured systems, tight gas sands, and coal gasification. The economics and feasibility for developing these sources are considered. (DC)

31590 Preliminary methane resource assessment of coalbeds in the Akroma basin. Rieke, H.H. III. pp 29-41 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

Potentially recoverable quantities of methane from unconventional sources such as coalbeds have been largely excluded from potential gas supply surveys. This is attributable to the lack of data about the resource, technology and economics of its recovery. In order to provide answers, DOE initiated the Methane Recovery from Coalbeds Project (MRCP) to characterize the gas-in-place for various coalbeds and associated sediments. Results are presented from the first phase of a joint effort between DOE (METC)), TRW, GRI, and Industry to investigate the coalbed methane resource in the Arkoma basin. Preliminary gas-in-place resource estimates were made based on the volume of coal in-place and on direct methane desorption data. It has been conservatively estimated that the total coal resource of the basin is about 7.9 billion tons. Seven individual coal seams have been identified as being the most likely candidates to contain potential coalbed gas reservoirs. Total gas contents, as determined by desorption tests on coal cores, range from 73 cubic feet per ton to 576 cubic feet per ton. The estimated unscaled in-place methane resource is 1.6 Tcf and is considered a low volumetric assessment for the basin. The estimated depth scaled in-place methane resource is 2.7 Tcf, 82 percent of which is contained in the Hartshorne coalbeds. Analyses of gas produced from the Hartshorne coals/Hartshorne Formation show a range of Btu values from 993 to 1118 in the western part of the basin. A viable exploration rationale has been established for the Arkoma basin, based on various geological aspects, such as stratigraphy and structure, the depth of the coalbeds and the recent MRCP well tests. The described methodology of methane exploration is present along with the results. Redefined target-test areas in the basin have been delineated and are discussed.

31591 Coalbed methane resource of the Illinois basin. Archer, P.L.; Carr, D.D.; Harper, D. pp 51-58 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

A program was initiated to determine the extent of the coalbed methane resource and the location of the most favorable resource areas within the Illinois basin, and to obtain a better understanding of the relationships between selected variables and the gas content of coals. Preliminary gas in-place resource estimates are made based on coal desorption data and the most favorable resource areas are outlined. Limited and/or poor data precluded establishing relationships between various geological-chemical/physical parameters and coal gas content. Further investigations are required to determine such relationships and to define what percentage of this resource is producible.

31592 Geological implications of gas production from in-situ gas hydrates. Holder, G.D.; John, V.T.; Yen, S. pp 59-65 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

Natural gas hydrates are believed to exist in large quantities in arctic regions and beneath the earth's oceans. Efficient thermal recovery of gas through hydrate dissociation is dependant on the geological and thermal conditions of the hydrate reservoir. Calculations for a steam injection recovery technique indicate the process is energy efficient and that a strong potential exists for gas production from hydrates.

31593 Perspective on Devonian shale gas exploration. Dean, C.S. pp 237-243 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

Since fractured reservoirs are essential to production, exploration rationales specific to the Devonian shale unconventional gas resource are characterized by a geologic fracture creating mechanism. One such predicts intense fracturing in the shale wherever proximally associated with the major thrust faults of the Appalachian overthrust belt. Gruy Federal No. 1 Grainger Co. (DOE EGSP-TN9), a U.S. Department of Energy (DOE)-funded rank wildcat located in Grainger County, TN, successfully tested that rationale. The well penetrated the Saltville Thrust Fault (stratigraphic throw: over 10,000 feet) and encountered the Devonian-Mississippian Chattanooga Shale in the lower plate. The shale proved to be 720 feet thick, of which 480 feet or 67% was anomalously radioactive (25 API above shale base line). Two hundred twenty (220) feet of core was recovered from the most highly radioactive (organic rich) intervals and a full suite of wireline logs was run. Widespread and locally intense fracturing in the shale, especially in the organic sections, observed in the core and evidenced by the logs vindicates

the exploration rationale. The well will be hydraulically fractured and tested to evaluate production potential.

31594 Natural gas from tight siltstones in the Catskill clastic wedge in West Virginia. Schwietering, J.F. pp 245-250 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

Stratigraphic studies of Middle and Upper Devonian rocks in West Virginia suggest that thick zones of interbedded siltstone and shale present between the Devonian Shale gas fields in southwestern West Virginia, and the gas fields in Upper Devonian sandstones and siltstones in central and eastern West Virginia may contain important reserves of natural gas. Wells drilled into these zones of interbedded siltstone and shale should be completed in the same way as wells drilled into the black shales; i.e., the entire zone should be fractured, not selected siltstones.

31595 Unconventional exploration for natural fractures. Hennington, W.M. pp 265-274 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

This is a progress report on the evaluation of a new unconventional exploration technique for locating the natural fracture reservoirs in the Devonian - Ohio Shale. Five PHASE I tests have been drilled, cored, logged, cased and are currently being tested. Findings to date indicate that the technique has been successful in predicting the presence of natural fractures. In the six well PHASE II program, scheduled for later this year, the technique will be used to define the limits of these fracture systems. If PHASE II is successful, the project will have demonstrated that natural fracture reservoirs can be selectively located with a high degree of certainty.

31596 Waynesburg College multiple coal seam methane extraction well. Kirr, J.N.; Eddy, G.E.; Rahsman, R.; McGinnis, N.F. pp 313-318 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

Waynesburg College is in the process of completing the drilling of a well through the Upper Pennsylvanian coals near Waynesburg, Greene County in southwestern Pennsylvania. The primary objective of this well was to determine the optimum method for the extraction of methane gas from a multiple number of coal seams, and secondly, to provide Waynesburg College with an alternate source of energy to heat the buildings on the campus. It is anticipated that the gas produced will replace 60 to 70 percent of the peak demand of the College. The well was drilled to a total depth of 442 meters using rotary percussion with air. After setting a water string of 22 cm casing, a 20 cm hole was drilled to the total depth. Production casing measuring 14 cm was cemented to the surface in a single stage. Perforation and fracturing were done on an incremental basis using a retrievable bridge plug. Data from the coring and logging operations indicated that only seven of the coal seams present at the site would be suitable for fracturing and gas production. The coals were divided in to three zones and perforated and fractured in turn to allow for maximum stimulation. The retrievable bridge plug was used to isolate the lower fractured seams from those above that were to be fractured. Fracturing was done with foam injected at a maximum rate of .03 m^3/s using a sand proppant to maintain the openings in the coal. The well, when completed, will be topped with a standard well head. A downhole positive displacement pump will be used to remove the water produced from the coals. The well is presently undergoing testing to determine its production potential. The gas produced will be run through a separator and dessicator before it is metered into a nearby existing commercial gas line for transportation to the Waynesburg College campus.

DRILLING, PRODUCTION, AND PROCESSING

REFER ALSO TO CITATION(S) 31559, 31588, 31596

31597 (UCRL—84064) **Potential methods for methane extraction from geopressured brine at high temperature and pressure.** Quong, R.; Owen, L.B.; Locke, F.E. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). 2 Jun 1980. Contract W-7405-ENG-48. 19p. (CONF-800931—1). NTIS, PC A02/MF A01.

From 55. Society of Petroleum Engineers of AIME annual technical conference and exhibition; Dallas, TX, USA (21 Sep 1980).

Recovery of methane from Gulf Coast geopressured-geothermal reservoirs does not appear to be profitable without a rise in natural gas prices to offset high production costs. If injection into the production reservoir becomes necessary to maintain productivity and to minimize subsidence, the injection pumping costs approach and even exceed the value of the recoverable methane. An option aimed at reducing the injection pump operating costs is to maintain a higher than normal pressure at the production wellhead to reduce the injection-pumping work load. This option, however, is considerably less attractive if that portion of methane still dissolved at elevated pressure cannot be recovered. Therefore, there is a strong incentive to devise methods for extracting methane at high pressures and temperatures. Liquid extraction with a very low water-soluble organic is a technically feasible method and looks promising as an applicable process. A candidate solvent is hexadecane, a paraffinic hydrocarbon with the necessary phase-equilibrium thermodynamic properties to satisfy the technical requirements for such an operation, without any obvious economic barriers. Gas stripping is another technically feasible method, but the economics do not look favorable because of gas dissolution losses. Freon refrigerants were considered because of their ease of product-stripping gas separation and nitrogen was considered because of its low cost. Brine-driven positive displacement pumps with provisions for methane exsolution are technically feasible concepts and could eliminate or greatly reduce pump power costs. These extraction operations will not preclude the option of recovering the thermal energy component, if desired.

31598 Wireline hydraulic fracturing tool for the determination of in situ stress contrasts. Voegele M.D.; Jones, A.H. pp 123-130 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

A significant amount of research has been devoted in the past few years to the study of fracture containment in stimulation of low permeability gas reservoirs. One finding of this research is that vertical fracture growth is controlled by contrasts in the in situ stress state. A knowledge of the variation of horizontal stress with depth would aid in the design of well stimulation. The only method available today for determining in situ stress at depths greater than about 200 meters is a small scale hydraulic fracturing technique; stress calculations are based upon several relatively simple measurements; however, at present the economics of sending the tool downhole on a tubing string are unfavorable. To overcome this problem the design of a self contained tool which operates on a standard seven conductor wireline cable has been undertaken. A major goal of the design effort is to build the tool primarily with commercially available components. The basic tool consists of a downhole hydraulic power supply control unit, straddle packers and pressure transducer; it has been designed to function in cased or open holes. Additionally, the tool design incorporates a fracture detection device so that orientation can be determined. In conjunction with the tool design a laboratory investigation utilizing 1 meter cubic samples is being pursued to study the mechanics of stress determination in cased boreholes. Since there is very little published literature on the determination of in situ stresses through perforated casing, it is hoped that the laboratory investigations will allow stress determinations in cased wells with the same degree of reliability that now exists for stress determinations in open holes.

31599 Utilizing well interference data in unconventional gas reservoirs. Sawyer, W.K.; Alam, J.; Rose, W.D. pp 137-149 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

This paper describes the use of a dual porosity radial gas flow simulator for estimating values for the key parameters controlling gas production from the Devonian shale or similar unconventional resource. Using best estimates from the literature on shale fracture and matrix properties as a starting point, the model is used to history match production decline and cumulative production data from a Devonian shale well in Meigs County, Ohio. Three sets of parameters were obtained which gave good agreement with the production data. Utilizing simulated pressures at a distance of 96 feet (29.3m) as a third matching parameter, it was possible to distinguish between the three cases and thus obtain a more unique match. From the results obtained it is concluded that interference data can provide additional information needed for determining the key parameters that control shale well deliverability.

31600 Utilization and recovery economics for vertical wells in coalbed methane. Gillies, A.; Snygg, A.J.; Dickehuth, D. pp 199-204 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

Previous economic studies of the recovery and utilization of methane from coalbeds using vertical wells were based on drain-

in advance of mining where a single seam is drained with well spacing designed for rapid predrainage. A production economics study has been conducted which shows that the lower overall investment costs for wider spacing and increased production from multiple seams result in gas recovery at costs well below current prices for new gas imports. When applied to some of the thicker, deeper Western coals, the method also results in a favorable ROI.

31601 Test results of stimulated wells in Devonian shales. Kumar, R.M.; Hartsock, J.H.; Frohne, K.H. pp 297-306 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

The long test times required to attain radial flow in stimulated Devonian shale gas wells are impractical. However, experience shows that a short test period (about two weeks) is sufficient to evaluate reservoir and fracture properties using conventional techniques followed by mathematical simulation of the observed pressures. History matches, whether unique or not (insufficient production data are available at present to establish uniqueness), give clear insight into reservoir properties, the effectiveness of frac treatment, and well deliverability.

31602 Methane recovery from deep unmineable coal seams. Allred, L.D.; Coates, R.L. pp 307-312 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

Mountain Fuel Supply Company and the U.S. Department of Energy are conducting a joint project to demonstrate production and recovery of methane gas from deep coal seams in the Book Cliffs coal field of central Utah. The objective is to drill three wells to depths near 3000 feet to detemine if commercial quantities of gas can be produced, and then to install production facilities for injecting the gas into the Mountain Fuel Supply gas transmission system. Two of the three wells have been drilled and testing has been initiated. Five coal seams were encountered at depths between 2681 and 3112 feet. Core samples were obtained and desorption measurements indicate gas contents up to 400 cu ft/ton. The gas is approximately 95 percent methane. Water influx tests were made and water pumping equipment is being installed. Plans are being formulated to hydraulically stimulate the principal coal seams with nitrogen foam to increase production.

31603 Advance methane control and its impact on gas emissions in the Pocahontas No. 3 coal seam. von Schonfeldt, H.A.; Pothini, B.R.; Aul, G.N. pp 347-354 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

Methane emissions into underground coal mines in certain areas of the United States represent a serious hazard and contribute to lowering mining productivity. In order to reduce methane emissions into some of the deep south West Virginia Coal Mines an advance methane drainage program was developed. This paper gives a State of the Art account of drilling long in-seam and slant holes into virgin areas of the Pocahontas No. 3 and No. 4 coalbeds. Directional drilling techniques are discussed. Methods to evaluate the drainage effectiveness of this program on the emissions in an operating mine are also covered. It is concluded than an effective methane drainage program can reduce methane emissions significantly thereby improving safety conditions in the mine. It also has the potential for increasing mining productivity. The recovered gas could also lead to a better utilization of our available energy resources.

31604 Analysis of the coalbed degasification process at a seventeen well pattern in the Warrior Basin of Alabama. Ancell, K.L.; Lambert, S.; Johnson, F.S. pp 355-370 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

This paper presents an analysis of the coalbed degasification process. The theoretical and experimental basis of the degasification process are discussed and a simulaton model which incorporates all aspects of this process is described. The simulator is demonstrated using actual field data developed by a joint industry/government demonstration project funded by the DOE and U.S. Steel. The basic reservoir description is discussed in detail, including variations of important description parameters with location. Initial and boundary conditions are demonstrated and analyzed. Initially, the coalbed was saturated with water. With water production, reservoir pressure is lowered, causing gas to desorb from the coal creating a mobile gas saturation. Subsequently, interwell interference effects are demonstrated and the need for such effects explained. Finally, the long term gas deliverability of the pattern is forecast. This forecast shows that about 45% of the gas within the pattern can be removed if the pattern is in operation six years ahead of mining.

31605 Well stimulation by two-phase flow. Graham, J.W. US Patent 4,174,753. 20 Nov 1979. Filed date 7 Sep 1977. 6p.

A method is claimed of treating a subterranean formation to remove fines lodged therein wherein a mixture comprising an aqueous liquid and an immiscible fluid is injected into the formation at matrix rates to cause two-phase flow. 4 figures.

31606 Gas conditioning conference. Norman, OK; University of Oklahoma (1978). 261p. (CONF-7803121—).

From Gas conditioning conference; Norman, OK, USA (6 Mar 1978).

Texts of the papers presented at the 28th annual gas conditioning conference are included. Fundamentals of gas cleaning, gas dehydration and gas treatment are discussed. Separate abstracts are prepared for individual items. (DC)

MARKETING AND ECONOMICS

REFER ALSO TO CITATION(S) 31577, 32064, 32393, 32403

31607 (DOE/EIA—0150(79)(80)) **Energy data report: natural gas deliveries and curtailments to end-use customers and potential needs for additional alternate fuels: 1979-1980 heating season (November-March).** Pugh, E.J. (Department of Energy, Washington, DC (USA). Energy Information Administration). Dec 1979. 183p. NTIS, PC A09/MF A01.

Data in this report are based on tabulations of an Energy Information Administration, United States Department of Energy, survey of 1478 gas companies (utilities, pipelines, and producers) that supply natural gas to end-use customers. Tables presented provide data on volumes of end-use customer deliveries, curtailments, and alternate fuel needs to offset gas curtailments. The information included deal only with markets for end-use. Volumes of gas for resale, delivered or curtailed are excluded. The tables provided are tabulations of gas company survey responses, compiled for the 1978-1979 actual and 1979-1980 projected heating seasons (5-month period, November through March) for State, DOE Region and total United States. Projected data are estimated by gas companies based on the assumptions of normal winter demand in their market areas. Actual data are based on metered volumes. Curtailments represent volumetric reductions from contract quantities, from normal historical quantities or from other bases the reporting firm has selected. Each respondent is allowed the latitude to formulate a curtailment definition that best reflects the conditions within his service area. Therefore, there is no comparability between respondent's data. The method utilized the first year (base year) must be used for all subsequent years. Requirements are defined as the sum of deliveries and curtailments. Totals between tables may show minor differences. These differences stem from reporting discrepancies in separate sections of company questionnaire returns from which these tables were tabulated. Table totals may not add due to independent rounding. Projected data for th 1978-1979 heating season are final tabulations of an earlier survey and may show minor differences from data previously published. All volumes are at 14.73 psia at 60°F.

ENVIRONMENTAL EFFECTS

REFER ALSO TO CITATION(S) 32820

31608 (DOE/EIS—0065) **Draft environmental impact statement for review and establishment of natural gas curtailment priorities.** (Department of Energy, Washington, DC (USA)). May 1980. Contract AC01-78RG03355. 136p. NTIS, PC A07/MF A01.

This draft EIS (Volume 3) and accompanying Regulatory Analysis (Volumes 1, 2, and 4) are prepared by the Economic Regulatory Administration (ERA) as part of a comprehensive programmatic review of alternatives to existing federal policy on curtailment of natural gas deliveries during periods of shortage. The curtailment of natural gas causes economic impacts and it causes curtailed users to substitute fuels which increase pollution. The findings of the Regulatory Analysis show that some alternative curtailment policies will reduce economic impacts below the level associated with existing federal policy. The findings of the draft EIS show that, for any given level of shortage, there are negligible overall differences between environmental impacts of alternative curtailment policies and environmental impacts of existing federal policy. No viable alternative was found which could reduce the overall level of environmental impacts. However, the Federal Energy Regulatory Commission (FERC) can, under any policy

alternative, exercise mitigation measures to reduce the level of impact in cases of special hardship.

ARTIFICIAL STIMULATION, PLOWSHARE, ETC.

REFER ALSO TO CITATION(S) 31556, 31593

31609 Laboratory investigation of enhanced recovery of methane from coal by carbon dioxide injection. Fulton, P.F.; Parente, C.A.; Rogers, B.A.; Shah, N.; Reznik, A.A. pp 65-73 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

An experimental procedure for determining the effectiveness of CO_2 injection into methane-containing coal samples for the purpose of enhancing methane production is described. Experimental results on both dry and water saturated samples reveal that CO_2 injection greatly enhances both production rate and recovery efficiency. Most effective is a cyclic CO_2 injection-gas production technique which recovered essentially all of the adsorbed methane in the 3 1/2 in. core samples used in the experiments.

31610 Effects of a no-proppant foam stimulation treatment on a coal seam degasification borehole. Mahoney, J.V.; Stubbs, P.B.; Schwerer, F.C. III; Dobscha, F.X. pp 73-94 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

A vertical borehole drilled into a friable coal seam was stimulated by using 53,000 gallons (200.6 m^3) of foam. Proppant materials were omitted from the treatment fluids and colored, fluorescent pigments were included. The borehole produced 6.6 MMcf (187,000 m^3) of methane at an average rate of 49 Mcfd (1390 m^3/d) during its 4-1/2 month lifetime. After the wellbore was mined through, both vertical and horizontal fracture surfaces were found to be decorated with fluorescent material. No significant penetration of the fluid into the overlying strata was found.

31611 Finite element model simulations associated with hydraulic fracturing. Advani, S.H. pp 151-162 of Unconventional gas recovery symposium. New York, NY; American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. (1980).

From SPE/DOE symposium on unconventional gas recovery; Pittsburgh, PA, USA (18 May 1980).

Recent emphasis on the recovery of unconventional gas resources has focussed efforts on the development and testing of innovative well stimulation techniques. The design of optimum hydraulic fracturing treatments, for specified reservoir conditions, requires sophisticated models for predicting the induced fracture geometry and interpreting governing mechanisms. This paper presents methodology and results pertinent to hydraulic fracture modeling for the Eastern Gas Shales Program (EGSP). The presented finite element model simulations extend available modeling efforts and provide a unified framework for evaluation of fracture dimensions and associated responses. Examples illustrating the role of multilayering, in situ stress, joint interaction, and branched cracks are given. Selected comparisons and applications are also discussed.

POLICY, LEGISLATION, AND REGULATION

REFER ALSO TO CITATION(S) 31586, 31608

OIL SHALES AND TAR SANDS

SITE GEOLOGY AND HYDROLOGY

SITE GEOLOGY

REFER ALSO TO CITATION(S) 32763

31612 (DOE/ET/12142—T1) Geologic and geochemical studies of the New Albany Group (Devonian Black Shale) in Illinois to evaluate its characteristics as a source of hydrocarbons. Quarterly progress report, January 1-March 31, 1980. Bergstrom, R.E.; Shimp, N.F. (Illinois State Geological Survey, Urbana (USA)). 1 Apr 1980. Contract AC05-76ET12142. 18p. NTIS, PC A02/MF A01.

This project is a detailed analysis of the lithology, stratigraphy, and structure of the New Albany Group in Illinois to determine those characteristics of lithology, thickness, regional distribution, vertical and lateral variability, and deformation that are most relevant to the occurrence of hydrocarbons. The mineralogic and petrographic properties of the New Albany Shale in Illinois are characterized. This includes the quantitative and qualitative characterization, by optical and x-ray techniques, of the inorganic mineral constituents, the dispersed organic matter, and the fabric of the shale. Not less than 49 major, minor, and trace elements are determined in 300 to 500 shale samples, which are representative cross sections of the cores taken. Organic and mineral carbon are included; total hydrogen; total sulfur and when that exceeds 0.5%, pyritic and sulfate sulfur. Also, other elements observed during normal routine analysis are reported. The character of off-gases from approximately 10-foot intervals in cores collected in the Illinois Basin is determined. In addition, the relative distribution of hydrocarbons is determined in ten specially prepared core samples, which are the same as those in previous unit. The carbon isotopic composition of methane in off-gases is determined from core samples whenever sufficient methane can be collected. This data is compared to other pertinent data such as gas composition and vitrinite reflectance for the purpose of making interpretations as to the origin and maturity of the gas. Laboratory experiments are performed to study the relative effects and significance of chemical and isotopic fractionation that occurs as gas is released from core samples. Data accumulated can be evaluated to gain a better understanding of the origin, migration, and location of natural gas associated with the shales.

31613 (DOE/METC/5202—13) Bibliography of the paleontology and paleoecology of the Devonian-Mississippian black-shale sequence in North America. Barron, L.S.; Ettensohn, F.R. (Kentucky Univ., Lexington (USA). Dept. of Geology). Jun 1980. Contract AC05-76ET12040. 90p. NTIS, PC A05/MF A01.

The Devonian-Mississippian black-shale sequence is one of the most prominent and well-known stratigraphic horizons in the Paleozoic of the United States, yet the paleontology and its paleoecologic and paleoenvironmental implications are poorly known. This is in larger part related to the scarcity of fossils preserved in the shale - in terms of both diversity and abundance. Nonetheless, that biota which is preserved is well-known and much described, but there is little synthesis of this data. The first step in such a synthesis is the compilation of an inclusive bibliography such as this one. This bibliography contains 1193 entries covering all the major works dealing with Devonian-Mississippian black-shale paleontology and paleoecology in North America. Articles dealing with areas of peripheral interest, such as paleogeography, paleoclimatology, ocean circulation and chemistry, and modern analogues, are also cited. In the index, the various genera, taxonomic groups, and other general topics are cross-referenced to the cited articles. It is hoped that this compilation will aid in the synthesis of paleontologic and paleoecologic data toward a better understanding of these unique rocks and their role as a source of energy.

OIL PRODUCTION, RECOVERY, AND REFINING

31614 Concentration-dependence of the effect of an in situ oil shale retort-produced water on metabolism. Nelson, K.F.; North, D.S.; Farrier, D.S. (Univ. of Wyoming, Laramie). *Bull. Environ. Contam. Toxicol.;* **23**: No. 6, 747-752(Dec 1979).

During the conduction of the Rock Springs Site 9 experiment a large volume of retort water was collected to support environmental research studies. This sample was designated Omega-9 retort water. The Omega-9 water has the following characteristics: pH 8.6, 1003 mg/l total organic carbon, and 30,300 mg/l of total dissolved solids which are principally bicarbonate, sodium, ammonium, thiosulfate, sulfate, chloride, and carbonate. Although the Omega-9 water cannot be ascribed as typical of in situ oil shale retort waters in general, its availability has supported numerous investigations into the treatment, disposal, use, and effects of such water. It is reported that consumption of undiluted Omega-9 water by 60 to 80 g Holtzman rats led to an increased rate of metabolism of hexobarbital in vivo and in vitro, an increased rate of metabolism of ethylmorphine in vitro, and an increased level of cytochrome P-450 activity. These observations indicated that Omega-9 water induced liver enzymes activity. The purpose of this study was to determine if the induction effect is concentration related.

IN SITU METHODS, TRUE AND MODIFIED

REFER ALSO TO CITATION(S) 31616

31615 Echoing in-situ combustion oil recovery project in a Utah tar sand. Johnson, L.A. Jr.; Fahy, L.J.; Romanowski, L.J.; Barbour, R.V.; Thomas, K.P. (US DOE, Laramie, Wyo). *J. Pet. Technol.;* **32**: No. 2, 295-305(Feb 1980).

This paper presents the description and analysis of a combination reverse and forward combustion experiment for the production of oil from a Utah tar sand. The experiment produced 25% of the

original oil in place from a 13-ft thick tar sand zone containing at 14/degree/API, million-plus cp oil. The results were encouraging for future tar sand production. The project was the second U.S. DOE-sponsored in-situ extraction process to be implemented. 19 refs.

SURFACE METHODS

REFER ALSO TO CITATION(S) 31616

REFINING

31616 (UCID—18763) **Shale oil cracking. 2. Effect on oil composition.** Burnham, A.K.; Sanborn, R.H.; Crawford, R.W.; Newton, J.C.; Happe, J.A. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Aug 1980. Contract W-7405-ENG-48. 27p. NTIS, PC A03/MF A01.

Results from spectroscopic investigations are presented that demonstrate the effect of oil cracking on shale oil composition. Techniques used include infrared spectroscopy, capillary column gas chromatography/mass spectroscopy and ^{13}C nuclear magnetic resonance. We show that cracking causes an increase in aromatic and alkene content of the oil. We compare our results for oils prepared in the laboratory with oils prepared in the TOSCO-II semi-works and in modified and true-in-situ combustion retorts. We demonstrate that the napthalene/2-methyl-naphthalene ratio is a good indicator of cracking conditions in an oil shale retort.

PROPERTIES AND COMPOSITION

REFER ALSO TO CITATION(S) 31521

DIRECT USES AND BY-PRODUCTS

REFER ALSO TO CITATION(S) 32871

HEALTH AND SAFETY

REFER ALSO TO CITATION(S) 32873, 32874, 32876

WASTE RESEARCH AND MANAGEMENT

REFER ALSO TO CITATION(S) 31527

ENVIROMENTAL ASPECTS

REFER ALSO TO CITATION(S) 32820, 32875

31617 (NP—24978) **Wind tunnel simulation of plume dispersion at Syncrude Mildred Lake site. Final report.** Wilson, D.J. (Alberta Univ., Edmonton (Canada)). 1979. 219p. NTIS (US Sales Only), PC A10/MF A01.

Syncrude Canada Ltd. is producing synthetic crude oil from a surface mine in the Athabasca Tar Sands area of North-Eastern Alberta. This present report was commissioned to assess the influence of tailings pond dike height on plume dispersion. The study results will be especially useful for atmospheric dispersions modellers concerned with terrain effects. The wind tunnel simulation of atmospheric dispersion on the Syncrude plant site encompassed four different problem areas: low level sources within the plant itself, the main stack plume, peak levels of time varying concentration, and the effect of wind shear on plume rise. For all of these studies the major variable was the location and height of the tailings pond dike, which will affect plume dispersion by the turbulence generated in its wake. All of these effects were studied using an 800:1 scale model of the plant site located in a simulated neutrally stable atmospheric boundary layer generated in a large wind tunnel. The model study was validated by comparing the measurements for flat terrain with established full scale correlations of atmospheric dispersion parameters such as plume rise and spreading rate.

REGULATIONS

31618 (EMD—79-65) **Legal and administrative obstacles to extracting other minerals from oil shale.** Staats, E.B. (General Accounting Office, Washington, DC (USA)). 5 Sep 1979. 42p. General Accounting Office, Washington, DC.

Report to the Congress by the Comptroller General of the United States.

Most of the oil shale in Colorado's Piceance Creek basin is intermingled with sodium and aluminous minerals. But Federal mining laws and procedures frustrate the development of methods for extracting these valuable resources. GAO believes that an unequivocal expression of congressional interest in optimal mineral recovery and streamlined administration of mineral development on public land is essential. The intent of present mining and leasing laws for development of low-grade and intermingled minerals is now open to more than one interpretation, which delays and renders uncertain important mineral development decisions.

NUCLEAR FUELS

REFER ALSO TO CITATION(S) 31452

RESERVES

31619 (CONF-800820—7(Draft)) **Data analysis and management for the Uranium Resource Evaluation Project.** Kane, V.E. (Union Carbide Corp., Oak Ridge, TN (USA). Nuclear Div.). 1980. Contract W-7405-ENG-26. 16p. NTIS, PC A02/MF A01.

From American Statistical Society meeting; Houston, TX, USA (11 Aug 1980).

The Department of Energy has funded a large data collection effort with the purpose of determining the US uranium resources. This Uranium Resource Evaluation (URE) Project required a large data management effort which involved collection, retrieval, processing, display, and analysis of large volumes of data. Many of the characteristics of this data processing system are relevant to other applications, particularly where routine processing involves analyses for input into numerous technical reports. The URE Project computing system has a modular program structure which has enabled a straightforward interface with both special and general graphics and analysis packages such as SAS, BMDP, and SURFACE II. Other topics include cost-effective computing, data quality, report quality computer output, and test versus production program development.

31620 (EPRI-EA—1374) **Analysis of AEC-ERDA-DOE and USGS uranium program data: disipline reviews and summary reports. Final report.** (Dames and Moore, San Francisco, CA (USA)). Mar 1980. 449p. NTIS, PC A19/MF A01.

Most of the literature dealing with the econmic geology and exploitation of uranium deposits in the United States has been published since 1950, primarily by the Department of Energy (DOE) and its predecessor agencies. The limited availability of much of these data, combined with the inexperience of many electric power utilities and, to some extent, mining companies with regard to uranium exploration, frequently resulted in the inauguration of ill-conceived and duplicative efforts. To assess the value of this literature in light of present knowledge, a systematic review of those publications dealing with uranium exploration, and the economic geology, evaluation, and exploitation of uranium deposits was undertaken. Matrix reports (summaries) have been prepared for each of the nearly 2500 documents reviewed. This material is available through the computerized literature search services of the Oak Ridge National Laboratory. In addition, thirteen discipline reviews and summary reports were compiled within the broad fields of uraium geology and mining engineering frm which any advances in knowledge would have the greatest impact on the future discovery and exploitation of uranium deposits. A final chapter presents a critique of the DOE National Uranium Resource Evaluation Program, as judged by members of the uranium industry. A two-part report summarizes and analyzes the results of this investigation. Part 1 is primarily an introduction to the various types of uranium deposits, the geologic and structural environments in which they occur, and the mechanisms for their emplacement. Part 2 considers the various techniques used to explore, evaluate, and exploit uranium deposits. The report is intended to serve as a major source of basic information concerning previous uranium-related studies for all those involved with the search for and utilization of uranium.

31621 (GJBX—142(80)) **Grand Canyon 1° x 2° NTMS area: Arizona. Data report.** Koller, G.R. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1979. Contract AC09-76SR00001. 126p. (DPST—79-146-19). NTIS, PC E05/MF $4.70.

This data report presents results of ground water and stream/surface sediment reconnaissance in the National Topographic Map Series (NTMS) Grand Canyon 1° x 2° quadrangle. Surface samples (sediment) were collected from 1013 sites. The target sampling density was one site per 16 square kilometers (six square miles). Ground water samples were collected at 84 sites. Neutron activation analysis (NAA) results are given for uranium and 16 other elements in sediments, and for uranium and 9 other elements in ground water. Mass spectrometry results are given for helium in ground water.

Field measurements and observations are reported for each site. Analytical data and field measurements are presented in tables and maps. Statistical summaries of data and a brief description of results are given. A generalized geologic map and a summary of the geology of the area are included. Data from ground water sites (on microfiche in pocket) include (1) water chemistry measurements (pH, conductivity, and alkalinity), (2) physical measurements where applicable (water temperature, well description, and scintillometer reading), and (3) elemental analyses (U, Al, Br, Cl, Dy, F, He, Mg, Mn, Na, and V). Data from sediment sites (also on microfiche in pocket) include (1) stream water chemistry measurements (pH, conductivity, and alkalinity), and (2) elemental analyses for sediment samples (U, Th, Hf, Al, Ce, Dy, Eu, Fe, La, Lu, Mn, Sc, Sm, Na, Ti, V, and Yb). Sample site descriptors (stream characteristics, vegetation, etc.) are also tabulated. Areal distribution maps, histograms, and cumulative frequency plots for most elements, U/Th, U/Hf, and Th/La ratios, and scintillometer readings for sediment samples are included on the microfiche.

31622 (GJBX—143(80)) **Uranium hydrogeochemical and stream sediment reconnaissance of the Shiprock NTMS quadrangle, New Mexico/Arizona, including concentrations of forty-two additional elements.** Morgan, T.L.; Purson, J.D. (Los Alamos Scientific Lab., NM (USA)). May 1980. Contract W-7405-ENG-36. 261p. (LA—7513-MS). NTIS, PC A12/MF A01.

A hydrogeochemical and stream sediment reconnaissance (HSSR) for uranium in the Shiprock NTMS quadrangle of northwestern New Mexico and northeastern Arizona was conducted. Totals of 372 water samples and 1676 sediment samples were collected from 1999 locations within the 20,000-km^2 area of the quadrangle at an average density of one location per 10 km^2. Water samples were collected from wells, springs, and streams and were analyzed for U. Sediment samples were collected from wet and dry streams and wet and dry springs and were analyzed for U, Th, and 41 additional elements. Discussion is limited to anomalous samples, which are considered to be those containing over 20 ppB uranium for waters and over 6 ppM uranium for sediments. Uranium concentrations in water samples range from below the detection limit of 0.02 ppB to 106.40 ppB with a mean of 4.49 ppB. Most of the anomalous water samples were collected from an area associated with Jurassic units in the western quarter of the quadrangle that is down hydrologic gradient from Black Mesa, an area of known U mineralization. Water samples from the western quarter of the quadrangle average 10.00 ppB uranium whereas samples from the remainder average only 2.61 ppB. Sediment samples from the quadrangle have U concentrations that range from 0.74 to 27.15 ppM and average 2.92 ppM. Most of the anomalous sediment samples were collected from scattered locations throughout the quadrangle, and many probably are contaminated by mining activities in areas of known mineralization. A group of anolalous samples from the northeastern corner of the quadrangle is associated with Tertiary units that have been reported to be favorable U host rocks, though no occurrences are known in these units. Background sediment U and Th levels seem to be related to the lithology of the underlying rocks.

31623 (GJBX—144(80)) **Uranium hydrogeochemical and stream sediment reconnaissance of the Casper NTMS Quadrangle, Wyoming, including concentrations of forty-two additional elements.** LaDelfe, C.M. (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 297p. (LA—7511-MS). NTIS, PC A13/MF A01.

As part of the National Uranium Resource Evaluation, the Los Alamos Scientific Laboratory conducted a Hydrogeochemical and Stream Sediment Reconnaissance in the Casper National Topographic Map Series quadrangle, Wyoming. Samples were collected in the fall of 1977 from 1553 locations within an area of 18 400 km^2 and included 536 water samples and 1370 sediment samples. Water samples were analyzed for uranium elements by delayed neutron counting and fluorometry. Sediment samples were analyzed for uranium, thorium, and 41 additional elements by neutron activation analysis, x-ray fluorescence, and arc-source emission spectroscopy. All field and analytical data are listed in the appendixes but only uranium and thorium and discussed in any detail in this report. In general, the data show a close correlation with the numerous occurrences of uranium in the Casper quadrangle. The quadrangle contains three major uranium mining areas - the Gas Hills, Crooks Gap, and Shirley Basin areas. High uranium values in water and sediment samples correlate strongly with the Gas Hills area and to a lesser degree with the other areas of uranium occurrence. Thorium concentrations tend to be highest in sediments from the southwest corner of the quadrangle. The median concentration of thorium in this area is twice that of the whole Casper quadrangle. A strong correlation between thorium and cerium suggests monazite or other resistate minerals in that region. High thorium and related low U/Th ratios were not observed in samples from the Wind River Basin north of the Granite Mountains. The Casper quadrangle contains many documented subeconomic uranium occurrences in addition to active mining areas. The data from this study correlate well with known uranium occurrences and perhaps may lead to reevaluation of some undeveloped areas.

31624 (GJBX—146(80)) **Hydrogeochemical and stream sediment reconnaissance: National Uranium Resource Evaluation program. Savannah River Laboratory semi-annual report, October 1979-March 1980.** (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Jul 1980. 37p. (DPST—80-138-1). NTIS, PC A03/MF A01.

This report summarizes the accomplishments, status, and program of the Savannah River Laboratory (SRL) contribution to the National Uranium Resource Evaluation (NURE) program. SRL has accepted responsibility for Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) of 1,500,000 square miles in 30 eastern and 7 far-western states. This report is a progress report covering the period October 1979 through March 1980. SRL efforts in the following areas are discussed: reconnaissance and detailed studies in geological programs; management, analysis, and interpretation of analytical and field data; reporting of HSSR results; sample preparation methods; and neutron activation analysis and other analytical techniques. The Appendix to the report summarizes the SRL-NURE production of the October 1979 - March 1980 period and the program plans for the second half of FY-1980. Page-scale maps are included that summarize the status and plans for sampling, chemical analyses, and open file data reports.

31625 (GJBX—147(80)) **Uranium in carbonatites: USA. Final report.** Nishimori, R.K.; Powell, J.D. (Powell and Associates, Grand Junction, CO (USA)). Jul 1980. Contract AC13-76GJ01664. 173p. NTIS, PC A08/MF A01.

This report is an analysis of the uranium potential of carbonatites in the US and includes suggestions for a number of genetic models for uranium in carbonatite. These models are applied to the evaluation of the Bearpaw Mountains, Montana, Powderhorn, Colorado, and Magnet Cove, Arkansas carbonatite bodies. Carbonatites comprise only a small fraction of a percent of the rock record but have received an inordinate amount of attention because of their disproportionate number of ore deposits and exotic composition. Uranium is commonly present in carbonatites in quantities greater than the crustal abundance of about 3 ppM U. As a consequence, there are numerous reports of uranium anomalies and low grade uranium mineralization in carbonatites. At present, uranium is mined as a byproduct at the Palabora, South Africa, carbonatite. Accumulated data suggest that several different genetic types of uranium mineralization in carbonatites may have exploration potential. The uraniferous dikes and fenites of the Bearpaw Mountains, Montana, contain pyrochlore having 23 to 30 percent U_3O_8. The geological setting of this carbonatite suggests that the dikes and associated fenites may represent the apices of a differentiated uraniferous carbonatite body at depth with greater uranium potential than surface indications. Local enrichments of uranium are observed at the Powderhorn, Colorado, carbonatite. However, these occurrences are sporadic and of minor importance. The Magnet Cove, Arkansas, carbonatite is considered to have no uranium potential.

31626 (GJBX—166(80)) **Uranium- and thorium-bearing pegmatites of the United States.** Adams, J.W.; Arengi, J.T.; Parrish, I.S. (Derry, Michener and Booth, Inc., Golden, CO (USA)). Apr 1980. Contract AC13-76GJ01664. 463p. NTIS, PC A20/MF A01.

This report is part of the National Uranium Resource Evaluation (NURE) Program designed to identify criteria favorable for the occurrence of the world's significant uranium deposits. This project deals specifically with uranium- and thorium-bearing pegmatites in the United States and, in particular, their distribution and origin. From an extensive literature survey and field examination of 44 pegmatite localities in the United States and Canada, the authors have compiled an index to about 300 uranium- and thorium-bearing pegmatites in the United States, maps giving location of these deposits, and an annotated bibliography to some of the most pertinent literature on the geology of pegmatites. Pegmatites form from late-state magma differentiates rich in volatile constituents with an attendant aqueous vapor phase. It is the presence of an aqueous phase which results in the development of the variable grain size which characterizes pegmatites. All pegmatites occur in areas of tectonic mobility involving crustal material usually along plate margins. Those pegmatites containing radioactive mineral species show, essentially, a similar distribution to those without radioactive minerals. Criteria such as tectonic setting, magma composition, host rock, and elemental indicators among others, all serve to help delineate areas more favorable for uranium- and thorium-bearing pegmatites. The most useful guide remains the radioactivity exhibited by uranium- and thorium-bearing pegmatites. Although pegmatites are frequently noted as favorable hosts for radioactive minerals, the general paucity and sporadic distribution of these minerals and inherent mining and milling difficulties negate the resource potential of pegmatites for uranium and thorium.

31627 (K/UR—32) **Detailed geochemical survey for east-central Minnesota, geology and geochemistry of selected uranium targets.**

Morey, G.B.; Lively, R.S. (Minnesota Geological Survey, St. Paul (USA)). 31 May 1980. Contract W-7405-ENG-26. 181p. NTIS, PC A09/MF A01.

Results of a detailed geochemical survey of approximately 6820 km² in parts of Aitkin, Carlton, Kanabec, and Pine Counties, east-central Minnesota are reported. Geochemical data are presented for 883 groundwater samples and 200 bedrock samples. Although all of the groundwaters in the study area have similar major-element concentrations and therefore presumably a common ancestry, small differences in the minor-element concentrations serve to characterize various aquifers, both in the Quaternary deposits and in the bedrock. All of the aquifers locally yield waters having statistically anomalous concentrations of uranium or radon, but these anomalies are spatially coincident only in a few places and particularly in three geologic environments considered favorable for uranium mineralization. These include the following: (1) Thomson Formation near the unconformably overlying Fond du Lac Formation, (2) Hinckley Sandstone near a major fault system, and (3) Denham Formation near the unconformity with the McGrath Gneiss, particularly where these rocks are faulted and overlain by the Fond du Lac Formation. One additional uranium environment characterized by thin laminae of uraniferous apatite was located in the Thomson Formation during outcrop reconnaissance and sampling. The coincidence of this and other anomalously high uranium values in the bedrock with specific uranium and radon anomalies in the groundwater confirms the usefulness of the hydrogeochemical data to uranium exploration in this glaciated terrane.

31628 (LA—8328-MS) **Multivariate statistical analysis of stream sediments for mineral resources from the Craig NTMS Quadrangle, Colorado.** Beyth, M.; McInteer, C.; Broxton, D.E.; Bolivar, S.L.; Luke, M.E. (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 99p. NTIS, PC A05/MF A01.

Multivariate statistical analyses were carried out on Hydrogeochemical and Stream Sediment Reconnaissance data from the Craig quadrangle, Colorado, to support the National Uranium Resource Evaluation and to evaluate strategic or other important commercial mineral resources. A few areas for favorable uranium mineralization are suggested for parts of the Wyoming Basin, Park Range, and Gore Range. Six potential source rocks for uranium are postulated based on factor score mapping. Vanadium in stream sediments is suggested as a pathfinder for carnotite-type mineralization. A probable northwest trend of lead-zinc-copper mineralization associated with Tertiary intrusions is suggested. A few locations are mapped where copper is associated with cobalt. Concentrations of placer sands containing rare earth elements, probably of commercial value, are indicated for parts of the Sand Wash Basin.

31629 (LA—8417-MS) **Gamma-ray spectral calculations for uranium borehole logging.** Close, D.A.; Evans, M.L.; Jain, M. (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 66p. NTIS, PC A04/MF A01.

Gamma-ray transport calculations were performed to determine the energy distribution of gamma rays inside a borehole introduced into an infinite medium. The gamma rays from the naturally occurring radioactive isotopes of potassium, thorium, and uranium were uniformly distributed in a sandstone formation (having a porosity of 0.30 and a saturation of 1.0) surrounding the borehole. A sonde was placed coaxially inside the borehole. Parametric studies were done to determine how the borehole radius, borehole fluid, and borehole casing influence the gamma-ray flux inside the sonde.

31630 (P—300-80-025) **Uranium resources: a review of estimation methodologies. Consultant report.** Sullivan, S.J. (California Energy Commission, Sacramento (USA)). May 1980. 69p. California Energy Commission, Sacramento.

The cost and reliability of nuclear power and the growth of nuclear installed generating capacity is dependent, in part, on the extent of the domestic uranium ore supply. Although existing uranium ore reserves can be estimated with acceptable accuracy, the size of the ultimate resource is uncertain. Several methods for estimating the resource size in different U_3O_8 cost categories have been developed. The assumptions, methodologies, and resource estimates resulting from their application are examined in this report. Estimates of domestic uranium resources vary by more than an order of magnitude. The disparities in resource estimates for various U_3O_8 cost categories are a function not only of the application of different methodologies but also of first, a lack of a precise generic model for uranium ore deposit formation and second, the existence of several factors that can significantly affect the cost of produced ore. It is concluded that the potential for the discovery of new domestic uranium ore deposits is uncertain. The availability and market price of foreign uranium reserves is less certain than that of the United States. Progress in resolving these uncertainties is necessary before an accurate estimate of future uranium availability can be obtained. To put the uranium supply situation into perspective, a brief history of the uranium industry describing past U_3O_8 market prices is presented.

31631 **Sedimentological controls of gold and uranium in two Witwatersrand paleoplacers.** Smith, N.D.; Minter, W.E.L. *Econ. Geol.;* 75: No. 1, 1-14(Jan-Feb 1980).

In an effort to develop a better understanding of gold and uranium distributions at the small and intermediate scales, a localized study of two Witwatersrand, South Africa, paleoplacers was undertaken with the specific goal of relating concentrations to identifiable and at least crudely interpretable sedimentary structures. The two units, the Leader reef and the Elsburg No. 5 reef, were chosen because both are marginally economic and because unmined pillars left for roof support provided excellent three-dimensional exposures for examination of larger structures, especially channels and bars. 47 refs.

EXPLORATION

REFER ALSO TO CITATION(S) 31620

31632 (GJBX—123(80)) **Statistical techniques applied to aerial radiometric surves (STAARS): percentile estimation with the normal and lognormal distributions.** Bement, T.R.; Pirkle, F.L. (Los Alamos Scientific Lab., NM (USA); Bendix Field Engineering Corp., Grand Junction, CO (USA)). Jun 1980. Contract AC13-76GJ01664. 28p. NTIS, PC A03/MF A01.

Because of the prominence of percentile estimation in the analysis of NURE aerial radiometric data, a study was conducted to compare two methods of estimating percentiles. The two methods of estimation considered are (1) the normal distribution assumption method and (2) the lognormal distribution assumption method. An error made by assuming the data are from a normal population, when in fact the population is lognormal, causes problems primarily when estimating tail percentiles. When estimating upper percentiles, the error of assuming lognormality, when the data are really normal, has more serious consequences than does the error of assuming normality, when the data are lognormal. When estimaing lower tail percentiles, the error of failing to perform a log-transformation has more serious consequences than does the error of transforming. When estimating percentiles that are between the 10th and 80th, the consequence of either type of error is not great if the coefficient of variation is less than 0.27.

31633 (GJBX—131(80)) **Engineering report on drilling in the Owens Lake area, California.** (Bendix Field Engineering Corp., Grand Junction, CO (USA)). Jul 1980. Contract AC13-76GJ01664. 36p. NTIS, PC E02/MF $3.50.

The Owens Lake Drilling Project was conducted by Bendix Field Engineering Corporation in support of the Department of Energy's (DOE) National Uranium Resource Evaluation (NURE) program. This project consisted of eight drill holes ranging in depth from 420 to 3.500 feet (128.02 to 1,066.80 m). A total of 19,205 feet (5,853.68 m) was drilled, of which 135.5 feet (41.30 m) were cored. The purpose of the Owens Lake project was to test the uranium potential of the Coso formation, Pliocene (upper) and Pleistocene (lower) in areas downdip from known zones of mineralization. This project started on June 22, 2979 and continued until February 21, 1980. Restoration and seeding started on February 22, 1980 and was completed on March 1, 1980. Engineering details, statistics, individual borehole histories, and geophysical logs of the eight holes drilled in Owens Lake, California drilling program are presented.

31634 (GJBX—140(80)) **Modeling study of gaseous Rn-222, Xe-133, and He-4 for uranium exploration.** Jeter, H.W. (Teledyne Isotopes, Westwood, NJ (USA)). 1980. Contract AC13-76GJ01664. 117p. NTIS, PC A06/MF A01.

This work presents one-dimensional mathematical models to simulate the transport of gaseous radon-222 (Rn-222), xenon-133 (Xe-133), and helium-4 (He-4) away from uranium ore deposits. The resulting concentrations of indicator nuclides in the overburden are used to infer the detectability of ore deposits by emanation methods. In the case of homogeneous, non-radioactive formations, Rn-222 and some of its daughter products are calculated to be detectable at distances of several tens of meters from a planar uranium ore deposit (1 m tickness, 0.6% U_3O_8, 20% emanation). Models of He-4 diffuson in rock yield highly uncertain results because measurements of diffusion coefficients in actual rock types are lacking and because the flux of helium from deep within the earth is generally unknown. Comparisons of model results to field data suggest that He-4 diffusion coefficients of 10^{-4} to 10^{-3} cm²/sec are appropriate. It is speculated that moisture in the rock column could reduce the coefficient significantly compared to the dry-soil case. Inhomogeneity in rock formations is simulated by a multiple-layer model. A comparison of fluorometric uranium data to gamma spectra measurements suggests the migration and deposition of Ra-226 near the water table. Modeling results are improved when this process is taken into account. A constant soil gas velocity of 1×10^{-4} cm/sec causes indicator concentrations to change by several orders of

magnitude. If steady upward soil gas motion exists in nature, the detectability of uranium ore by emanation methods will be significantly different from that indicated by pure diffusion models. Barometric influences on gas transport are simulated by time-dependent numerical models.

31635 (GJBX—149(80)) **Aerial gamma ray and magnetic survey: Mississippi and Florida airborne survey, Springfield quadrangle of Missouri. Final report.** (EG and G GeoMetrics, Sunnyvale, CA (USA)). Jun 1980. Contract AC13-76GJ01664. 234p. NTIS, PC E06/MF $3.95.

The Springfield quadrangle of southern Missouri contains a portion of the Ozark Uplift. Near-surface Precambrian rocks are almost completely covered in this area by a thin veneer of Paleozoic carbonates. The region has undergone recent uplifting. Several faults cut through the Paleozoic section but show no extreme displacement. Examination of available literature shows no known uranium deposits (or occurrences) within the quadrangle. Fifty-six groups of uranium samples were defined as anomalies and discussed briefly. None were considered significant, and most appeared to be of cultural origin. Magnetic data were influenced largely by the underlying Precambrian. The structure and lithology of the Precambrian is apparently complex, and suggests that some surface faults may extend into the basement material.

31636 (GJBX—150(80)) **Aerial gamma ray and magnetic survey: Mississippi and Florida airborne survey, Harrison quadrangle, Missouri and Arkansas. Final report.** (EG and G GeoMetrics, Sunnyvale, CA (USA)). Jun 1980. Contract AC13-76GJ01664. 262p. NTIS, PC E07/MF $3.95.

The Harrision quadrangle of southern Missouri and northern Arkansas lies intermediate between the Ozark Plateau and the Boston Mountains, on the southern limb of the Ozark Uplift. Near-surface Precambrian rocks are almost completely covered in this area by a thin veneer of Paleozoic carbonates. The region has undergone recent uplifting. Several faults cut through the Paleozoic section but show no extreme displacement. Examination of available literature shows no known uranium deposits (or occurrences) within the quadrangle. Sixty-six groups of uranium samples were defined as anomalies and are discussed briefly. None were considered significant and most appeared to be of cultural origin. Magnetic data were influenced largely by the underlying Precambrian. The structure and lithology of the Precambrian is apparently complex, and suggests that some surface faults may extend into the basement material.

31637 (GJBX—151(80)) **Aerial gamma ray and magnetic survey: Mississippi and Florida airborne survey, Shreveport quadrangle of Louisiana. Final report.** (EG and G GeoMetrics, Sunnyvale, CA (USA)). Jul 1980. Contract AC13-76GJ01664. 267p. NTIS, PC E07/MF $3.95.

The Shreveport quadrangle of northwestern Louisiana lies intermediate between the axes of the Sabine and Monroe Uplifts in the Gulf Coastal Physiographic Province. Tertiary and Quaternary sediments dominate the exposed sequence, but the region contains a substantial thickness of Mesozoic rocks as well. Examination of available literature shows no known uranium deposits in the quadrangle. Fifty-four groups of uranium samples were defined as anomalies and discussed briefly. None were considered significant, and most appeared to be of cultural origin. Magnetic data appeared to define the shallower portions of the Sabine Uplift quite well. Other structures in the area were not as well defined by the magnetics.

31638 (GJBX—152(80)) **Aerial gamma ray and magnetic survey: Mississippi and Florida airborne survey, Alexandria quadrangle of Louisiana and Texas. Final report.** (EG and G GeoMetrics, Sunnyvale, CA (USA)). Jul 1980. Contract AC13-76GJ01664. 303p. NTIS, PC E08/MF $3.95.

The Alexandria quadrangle lies on the border between Texas and Louisiana in the northern Gulf Coastal Physiographic Providence. The area overlies portions of the Sabine Uplift in the northwest, but sediments are both Quaternary and Tertiary in age and represent both marine and nonmarine depositional environments. A search of available literature revealed no known uranium anomalies. Sixty-nine uranium anomalies were detected and are discussed briefly. Only those anomalies in the high thorium area were considered significant. Most of the rest of the anomalies appeared to be of cultural origin. Magnetic data appeared to be in agreement with existing structural interpretations of the region.

31639 (GJBX—153(80)) **Aerial gamma ray and magnetic survey: Mississippi and Florida airborne survey, Jackson quadrangle of Mississippi and Louisiana. Final report.** (EG and G GeoMetrics, Sunnyvale, CA (USA)). Jul 1980. Contract AC13-76GJ01664. 260p. NTIS, PC E07/MF $3.95.

The Jackson quadrangle covers a region largely within the Mississippi River flood plain. In the extreme northern Gulf Coastal Physiographic Province. Underlying Mesozoic and Cenozoic sediments of the Mississippi Embayment are relatively thick. Exposed sediments are largely Quaternary in age, though older Cenozoic material of both marine and nonmarine origin are exposed in areas adjacent to the flood plain in the east. A search of the available literature revealed no known uranium deposits. Seventy-three uranium anomalies were detected and are discussed briefly. None were considered significant, and most appeared to be of cultural origin. Magnetic data appears to be in agreement with existing structural interpretations of the region.

31640 (GJBX—154(80)) **Aerial gamma ray and magnetic survey: Mississippi and Florida Survey, Meridian quadrangle of Mississippi and Alabama. Final report.** (EG and G GeoMetrics, Sunnyvale, CA (USA)). Jul 1980. Contract AC13-76GJ01664. 323p. NTIS, PC E08/MF $3.50.

The Meridian quadrangle of Alabama and Mississippi lies on the northeastern edge of the Gulf Coastal Physiographic Province. The structure of the area is complex, with thick wedge of Mesozoic and Cenozoic sediments covering the northwesterly-trending Ouachita Tectonic Zone, and the northeasterly-trending Appalachian Front. Cretaceous rocks are exposed in the northeast, whereas the balance of the quadrangle contains exposures of Tertiary and Quaternary sediments. Examination of available literature shows no known uranium deposits in the quadrangle. One hundred groups of uranium samples were defined as anomalies and discussed briefly in this report. One group of anomalies in Cretaceous rocks was considered as being possibly significant. Most of the remaining anomalies appeared to be of cultural origin. Magnetic data suggests deep-seated magnetic sources, and at the map scale, are not realistically correlatable with known sedimentary structures.

31641 (GJBX—155(80)) **Aerial gamma ray and magnetic survey: Mississippi and Florida airborne survey, Hattiesburg quadrangle of Mississippi, Alabama, and Louisiana. Final report.** (EG and G GeoMetrics, Sunnyvale, CA (USA)). Jul 1980. Contract AC13-76GJ01664. 279p. NTIS, PC E07/MF $3.95.

The Hattiesburg quadrangle of Mississippi, Alabama, and Louisiana lies in the northern Gulf coastal Physiographic Province. The region overlies a portion of the intersection the Ouachita Tectonic Belt and the Appalachian Front, but is covered with a substantial thickness of sediments post dating the orogenic periods. Several faults and a minor flexure zone cut across the northeastern quadrant. Examination of available literature shows no known uranium deposit within the quadrangle. Seventy-four groups of uranium samples were defined as anomalies and are discussed briefly. None were considered significant, and most appeared to be of cultural origin. Magnetic data showed extremely low gradients, and suggest deep-seated magnetic sources. Relatively higher gradients in the fault/flexure zone suggest slightly shallower sources in this area.

31642 (GJBX—156(80)) **Aerial radiometric and magnetic survey: Del Rio National Topographic Map, Texas. Final report.** (Geodata International, Inc., Dallas, TX (USA)). May 1980. Contract AC13-76GJ01664. 244p. NTIS, PC E11/MF $12.55.

The results of analyses of the airborne gamma radiation and total magnetic field survey flown for the region identified as the Del Rio National Topographic Map NH14-7 are presented. The airborne data gathered are reduced by ground computer facilities to yield profile plots of the basic uranium, thorium and potassium equivalent gamma radiation intensities, ratios of these intensities, aircraft altitude above the earth's surface, total gamma ray and earth's magnetic field intensity, correlated as a function of geologic units. The distribution of data within each geologic unit, for all surveyed map lines and tie lines, has been calculated and is included. Two sets of profiled data for each line are included, with one set displaying the above-cited data. The second set includes only flight line magnetic field, temperature, pressure, altitude data plus magnetic field data as measured at a base station. A general description of the area, including descriptions of the various geologic units and the corresponding airborne data, is included also.

31643 (GJBX—157(80)) **Aerial radiometric and magnetic survey: Eagle Pass National Topographic Map, Texas. Final report.** (Geodata International, Inc., Dallas, TX (USA)). May 1980. Contract AC13-76GJ01664. 228p. NTIS, PC E08/MF $10.25.

The results of analyses of the airborne gamma radiation and total magnetic field survey flown for the region identified as the Eagle Pass National Topographic Map NH14-10 are presented. The airborne data gathered are reduced by ground computer facilities to yield profile plots of the basic uranium, thorium and potassium equivalent gamma radiation intensities, ratios of these intensities, aircraft altitude above the earth's surface, total gamma ray and earth's magnetic field intensity, correlated as a function of geologic units. The distribution of data within each geologic unit, for all surveyed map lines and tie lines, has been calculated and is included. Two sets of profiled data for each line are included, with one set displaying the above-cited data. The second set includes only flight line magnetic field, temperature, pressure, altitude data plus magnetic field data as measured at a base station. A general description of the area, including descriptions of the various geologic units and the corresponding airborne data, is included also.

31644 (GJBX—159(80)) **Hydrogeochemical and stream sediment reconnaissance basic data for Rapid City NTMS Quadrangle, South Dakota.** (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 30 Jun 1980. Contract W-7405-ENG-26. 255p. (K/UR—139). NTIS, PC A12/MF A01.

Results of a reconnaissance geochemical survey of the Rapid City Quadrangle are reported. Field and laboratory data are presented for 417 groundwater and 477 stream sediment samples. Statistical and areal distributions of uranium and possible uranium-related variables are displayed. A generalized geologic map of the survey area is provided, and pertinent geologic factors which may be of significance in evaluating the potential for uranium mineralization are briefly discussed. Groundwater data indicate that the most promising areas for uranium mineralization are in the central portion of the quadrangle in the Pierre Shale. Three main clusters of groundwater samples with high uranium values occur here. Associated with the high uranium concentrations are high values for calcium, potassium, magnesium, strontium, and specific conductance. Stream sediment data indicate high concentrations of uranium are usually found in the Pierre Shale. Scattered samples occur in the Graneros Shale and in the Paleozoic and Precambrian units of the Black Hills. Arsenic, cobalt, and yttrium are associated with the areas of high uranium concentration. No areas are indicated with strong potential for uranium mineralization.

31645 (K/UR—40) **Hydrogeochemical and stream sediment detailed geochemical survey for Lakeview, Oregon.** Butz, T.R.; Tieman, D.J.; Vreeland, J.L.; Bard, C.S.; Leimer, H.W.; Helgerson, R.N.; Grimes, J.G.; Pritz, P.M. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 31 May 1980. Contract W-7405-ENG-26. 571p. NTIS PC E12/MF $3.50.

Field and laboratory data are reported for 231 groundwater, 881 stream sediment, and 303 stream water samples. Statistical and areal distributions of uranium and possible uranium-related variables are displayed. A generalized geologic map of the area is provided and pertinent geologic factors which may be of significance in evaluating the potential for uranium mineralization are discussed. Uranium concentrations in groundwater average 0.82 ppB. High uranium concentrations are generally associated with high concentrations of dissolved solids. Scattered areas displaying anomalous uranium (≧ 1.00 ppB), low dissolved solid content, high uranium/boron and uranium/specific conductance values, and significant arsenic and molybdenum concentrations occur in waters derived from volcanic rocks and are considered more favorable indications of uranium mineralization. Stream sediment data reveal that above background values of soluble uranium are commonly associated with Pliocene rhyolitic intrusive plugs. Anomalous uranium is also found in tuffaceous and basaltic units of the Upper Cedarville Formation, which have been intruded by the rhyolite plugs and influenced by hydrothermal fluid activity presumably accompanying plug emplacement. High mercury and arsenic concentrations are commonly associated with significant uranium concentrations. Low uranium concentrations are generally observed in stream waters. Samples where relatively high uranium concentrations are present generally contain significant concentrations of dissolved solids which are probably derived from volcanic source rocks. Scattered samples which are anomalous with respect to uranium (≧ 0.80 ppB) and display low to moderate dissolved solids content, high uranium/boron and uranium/specific conductance values, and high arsenic values may define potentially favorable areas for uranium mineralization.

MINING

REFER ALSO TO CITATION(S) 31620

FEED PROCESSING

31646 (ENICO—1041) **Investigation of the properties of UO_3 in a fluidized-bed denitration unit.** Dahl, C.A. (Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA)). Jun 1980. Contract AC07-79ID01675. 35p. NTIS, PC A03/MF A01.

An investigation into the nature of UO_3 particle formation in a fluidized-bed denitration unit was conducted and compared to denitrator operating experience at the Idaho Chemical Processing Plant (ICPP). Optimum operating conditions for the denitrator unit at the ICPP are defined, solutions for basic problems in the unit are discussed, and several in-plant tests are proposed to verify the mechanism of particle formation. 8 figures, 3 tables.

31647 **Laboratory and pilot plant studies on conversion of uranyl nitrate to uranium hexafluoride.** Urza, I.J.; Kilian, D.C. (Exxon Nuclear Co., Inc., Richland, WA). pp 547-559 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

Fluidized-bed processes will be used for conversion of UNH to UF_6 in the Exxon fuel reprocessing plant. This paper describes the laboratory and pilot plant studies conducted at ORNL on this conversion and on the purification of UF_6. These studies covered removal of residual nitrate from UO_3, Tc fluorination-sorption, UNH calcination, and UO_3 fluorination. (DLC)

31648 **Process for extracting uranium from ores.** Poitte, J. (to Societe Technique des Entreprises Chimiques). US Patent 4,175,108. 20 Nov 1979. Priority date 31 May 1976, France, 8p.

A process is claimed for the extraction of uranium from ores which is an improvement in the known dry attack treatment of uranium ores to an economical yet high rate of extraction. The process concerns solubilization of the uranium contained in the ores and consists of carrying out digestion of the mixtures of ore and reagent, with the possible addition of oxidizing agents. The process is carried out on an improved trough type of conveyor belt at predetermined conditioning of temperatures and humidity. 3 figures.

SPENT FUELS REPROCESSING

REFER ALSO TO CITATION(S) 31686, 32577, 32645, 32647

31649 (DP-MS—80-22) **Conceptual design of a spent LWR fuel recycle complex.** Kirk, B.H. (Du Pont de Nemours (E.I.) and Co., Wilmington, DE (USA). Engineering Dept.). 1980. Contract AC09-76SR00001. 70p. (CONF-800901—4). NTIS, PC A04/MF A01.

From Symposium on intermediate range atmospheric transport processes and technology assessment; Gatlinburg, TN, USA (29 Sep 1980).

Purpose was to design a licensable facility, to make cost-benefit analyses of alternatives, and to aid in developing licensing criteria. The Savannah River Plant was taken to be the site for the recycle complex. The spent LWR fuel will be processed through the plant at the rate of 3000 metric tons of heavy metal per year. The following aspects of the complex are discussed: operation, maintenance, co-conversion (Coprecal), waste disposal, off-gas treatment, ventilation, safeguards, accounting, equipment and fuel fabrication. Differences between the co-processing case and the separated streams case are discussed. 44 figures. (DLC)

31650 **Actinide separations.** Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980). 609p. (CONF-790415—P5).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Ap. 1979).

Actinide recovery, partition, and purification are explored. The 39 chapters are grouped into six sections: ion exchange and precipitation, solvent extraction, pyrochemical and photochemical methods, power reactor fuel reprocessing, recovery from waste solution, and general methods/review papers. Separate abstracts were prepared for 29 of these chapters; the remaining ten chapters have been previously abstracted. (DLC)

31651 (RFP—2979) **Literature search for the non-aqueous separation of zinc from fuel rod cladding.** Sandvig, R.L.; Dyer, S.J.; Lambert, G.A.; Baldwin, C.E. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 21 Jun 1980. Contract AC04-76DP03533. 68p. NTIS, PC A04/MF A01.

This report reviews the literature of processes for the nonaqueous separation of zinc from dissolved fuel assembly cladding. The processes considered were distillation, pyrochemical processing, and electrorefining. The last two techniques were only qualitatively surveyed while the first, distillation, was surveyed in detail. A survey of available literature from 1908 through 1978 on the distillation of zinc was performed. The literature search indicated that a zinc recovery rate in excess of 95% is possible; however, technical problems exist because of the high temperatures required and the corrosive nature of liquid zinc. The report includes a bibliography of the surveyed literature and a computer simulation of vapor pressures in binary systems. 129 references.

31652 **Recovery of plutonium traces from nitric acid-fluorhydric acid solutions by sorption onto alumina.** de Araujo, J.A.; Abrao, A. (Chemical Engineering Center, Pinheiros, Brazil). pp 10-16 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

Successful experiments for the retention of plutonium onto alumina from HNO_3-HF solution gave enough confidence to recommend the proposed method to separate traces of plutonium from waste solutions in the presence of macroamounts of uranium (VI). Only macroamounts of thorium, uranium (IV) and rare earths are serious interfering ions, since they precipitate with HF. The behav-

ior expected for neptunium in the same system should be similar to plutonium, thorium and rare earths. The retention of neptunium from HNO_3-HF solutions is in progress. The sorption yield for Pu was around 95%. The sorption mechanism is not well established.

31653 Plutonium peroxide precipitation: review and current research. Hagan, P.G.; Miner, F.J. (Rockwell International, Golden, CO). CONTRACT DE-AC04-76PP03533. pp 51-67 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

Increasing the HNO_3 concentration decreases the filtration time but increases the plutonium concentration in the filtrate. A compromise was therefore necessary. If a minimum plutonium concentration is required in the filtrate, the acidity could be lowered to 1.9M with an approximate doubling in the filtration time. The H_2O_2 concentration has little effect on filtration time. However, the higher the H_2O_2 concentration, the less plutonium lost to the filtrate. Concentrations higher than the 22 moles/mole Pu recommended (at least up to 30 molar which was the highest investigated) would be beneficial if reagent costs are not excessive and production capacity exists for destroying the excess H_2O_2 in the filtrate. Although the effect is not large, filtration time is shorter and the plutonium concentration in the filtrate is lower if metallic impurities are present. The slowest rate of H_2O_2 addition investigated gives a plutonium peroxide precipitate with the fastest filtration time. The rate of addition has very little effect on the plutonium concentration in the filtrate. The temperature has little effect on the filtration time. 14°C is recommended since decomposition of H_2O_2 would be slower at 14°C than at 22°C (min. Pu content in the filtrate). The effect of digestion time on both the filtration time and the plutonium content in the filtrate is minor, so the shortest digestion time investigated is recommended.

31654 Extraction of uranium (VI) from sulfuric acid solutions by tri-n-octylphosphine oxide. Sato, T. (Shizuoka Univ., Hamamatsu, Japan). pp 117-129 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

The distribution of uranium (VI) between sulfuric acid solutions and solutions of tri-n-octylphosphine oxide (TOPO) in organic solvent has been investigated under different conditions. The aqueous and organic phases are examined spectrophotometrically, and the organic phases by infrared and nuclear magnetic resonance spectroscopies. As a result, it is found that the extraction is expressed by the equilibrium equation $UO_2SO_4(aq) + 2TOPO(org) \rightleftharpoons UO_2SO_4.2TOPO(org)$, in which the extracted species exists as a complex $[UO_2SO_4(H_2O)(TOPO)_2]$ in an octahedral arrangement. Additionally, the obtained results are compared with those for the extraction from nitric and hydrochloric acid solutions.

31655 National program for pyrochemical and dry processing of spent reactor fuel. Bean, C.H.; Steindler, M.J. (Argonne National Lab., IL). pp 177-189 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

Pyrochemical processing methods may offer unique advantages over more conventional aqueous methods with respect to meeting nonproliferation goals. Some pyrochemical processes are intrinsically proliferation resistant because the process is incapable of producing a weapons-usable product without significant alterations. The product also can be sufficiently radioactive that it is physically difficult to divert. These features warrant the examination of pyrochemical and dry processing methods under current nonproliferation policies.

31656 Pyrochemical coprocessing of uranium dioxide-plutonium dioxide LMFBR fuel by the salt transport method. Knighton, J.B.; Baldwin, C.E. (Rockwell International, Golden, CO). pp 191-206 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

The pyrochemical coprocessing of spent nuclear fuel by the Salt Transport Process appears to be a potentially viable reprocessing method, not only as an exportable proliferation resistant technology, but as a domestic reprocessing operation. All operations are nonaqueous and waste generation is in solid form, thus requiring no conversion from aqueous solutions to solids. Though considerable development effort was conducted in the 1950's and 1960's on pyrochemical processes, further development is required before Salt Transport can be performed on a production scale.

31657 AIROX dry pyrochemical processing of oxide fuels: a proliferation-resistant reprocessing method. Grantham, L.F.; Clark, R.G.; Hoyt, R.C.; Miller, J.R. (Rockwell International, Canoga Park, CA). Contract EY-76-C-03-0701. pp 219-232 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

Potential diversion of nuclear material from power production to weapons production by national or subnational groups has resulted in a reevaluation of the proliferation resistance of various fuel cycles. The low-contamination fuel cycle, utilizting AIROX dry processing, is proliferation resistant due to the retention of fission products with the fuel and to the low concentration of fissile material in all process steps. In the AIROX process, UO_2 is oxidized with air to U_3O_8 to expand the fuel volume which simultaneously declads and pulverizes the fuel; the fuel is subsequently reenriched, repelletized, and recycled to the reactor. Fuel cycles utilizing this method of reprocessing will extend our uranium reserves, decrease the spent fuel storage requirements, and decrease the amount of waste requiring storage in a Federal Repository for environmental isolation. AIROX reprocessing is applicable to both light-water reactor fuel cycles as well as fast-breeder fuel cycles.

31658 Molten salt oxidation-reduction processes for fuel processing. Morgan, L.G.; Burger, L.L.; Scheele, R.D. (Pacific Northwest Lab., Richland, WA). CONTRACT EY-76-06-1830. pp 233-252 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

Several issues critical to molten nitrate processes for fuel reprocessing were studied: precipitation of uranates; behavior of Pu relative to U; handling of ThO_2; separation of alkali metal cations from the uranate; and control of fission products during uranate precipitation and dissolution. (DLC)

31659 Plutonium partitioning methods in power reactor fuel reprocessing. Schneider, A.; Wahlig, B.G. (Georgia Inst. of Tech., Atlanta). pp 279-290 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

The Purex process will continue to be the main method for the reprocessing of nuclear reactor fuels. The inherent flexibility of this process allows for modifications needed to accommodate a large range of fuel compositions and product specifications. Among the several plutonium partitioning methods developed, those avoiding the introduction of extraneous metal ions (e.g., U^{4+}, HAN, electrolytic) are likely to be favored. In situ reduction methods have introduced new equipment concepts which may be particularly well suited for the processing of breeder fuel with high plutonium content. 39 references, 5 figures.

31660 Development of the electropulse column for uranium-plutonium parition in the AGNS reprocessing plant. Cermak, A.F.; Spaunburgh, R.G. (Allied-General Nuclear Services, Barnwell, SC). pp 291-301 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

Initial experiments were performed to verify and demonstrate the feasibility of the electrolytic reduction method with uranium, followed by experiments with a mixture of uranium and plutonium. Experiments were conducted batchwise in a small electrolytic cell. Basic parameters, such as concentration of solutes and type of holding agents (in the aqueous phase) for removal of any nitrite which would reoxidize the reduced heavy metal, electrode material and geometry, off-gas composition and type of diaphragm, were also determined. These data were valuable in the electrolytic reduction process.

31661 Electroredox procedures for plutonium in power reactor fuel reprocessing. Baumgaertner, F.; Goldacker, H.; Schmeider, H. (Kernforschungszentrum Karlsruhe GmbH, Germany). pp 303-316 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

Redox processes are used in the Purex process to alter the valency of Pu, U, or Np in order to produce these metals with a high degree of purity. This paper describes the development of electroredox processes at Karlsruhe. Electroreduction was carried out in mixer-settlers and pulsed columns; electro-oxidation of the Pu(III) product was studied. 6 figures, 2 tables. (DLC)

31662 Separation of uranium and plutonium by electrolytic reduction in the purex process. Jian-Yu, H.; Qing-Xuan, Z.; Long-Jun, L. (Institute of Atomic Energy, Beijing, China). pp 317-331 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

Experiments on the electrolytic reduction of U and Pu in the aqueous phase in presence of hydrazine were carried out. The potentials of the aqueous solution were measured and operating parameters such as acid concentration, hydrazine concentration, applied potential on the cathode, etc., were investigated. Results indicated that, on Ti-cathode nitric acid could be reduced to nitrous even when there is no HNO_2 in the initial HNO_3 solution; and, with a U/Pu ratio ranging from 10^{-2} to 10^2, Pu(IV) can be reduced readily when the U/Pu ratio is near or more than 1 at low concentration of Pu. In this case, obviously U(IV) formed in the process plays an important role in the reduction of Pu(IV). To investigate the feasibility for applying this method in the partitioning of U and Pu in the first cycle of the Purex process, electrolytic reduction experiments have been carried out in a Milli-type mixer-settler counter-current extraction apparatus, with the first 9 stages serving as the electrolysis cells and the remaining ones for the back washing of uranium. With a flow rate of 1BF/1BX/1BS of 5/1/1, a separation factor SF(u) varying from 10^3 to 10^4 was obtained, depending on the current density as well as the acid concentration in the BS part of the battery 1B. The organic wash stream was acidified to increase the acid concentration in the BS part so as to obtain a high SF(u). Satisfactory results for the separation on U and Pu were obtained.

31663 Studies on actinides separation in JAERI. Ishimori, T. (Japan Atomic Energy Research Inst., Tokyo). pp 333-350 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

The separation of actinides has been studied for various purposes in Japan Atomic Energy Research Institute (JAERI). Studies carried out so far, are classified into four categories: preparation of actinide nuclides, separation chemistry for chemical analysis, separation of actinides from radioactive waste, and reprocessing of spent nuclear fuels. The present work is to review studies of actinide separation performed in JAERI, emphasizing the need of the separation for the main purpose of individual. Concern is focussed on the separation of transuranium elements and studies on thorium and uranium are put aside. 9 figures.

31664 Heavy element separation for thorium-uranium-plutonium fuels. Grant, G.R.; Morgan, W.W.; Mehta, K.K.; Sargent, F.P. (Atomic Energy of Canada Ltd., Manitoba). pp 351-369 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

The flowsheet presented here has been shown, in laboratory tests using mixer-settlers, to be suitable for separating the three actinides, Th, U and Pu from each other. Successful partitioning of Pu (III) from Th was achieved when ferrous sulfamate was used as the Pu-holding reductant. The flows and acidities required for recovery of Th with the solvent stream from Contractor III are such that hydroxylamine nitrate cannot prevent the oxidation of Pu (III) which occurs predominantly in the organic phase in the settlers, and Pu losses are sustained. The oxidation of Pu (III) in the organic phase and its enhancement by the presence of HNO_2 in the organic phase was confirmed. SECTOR, a modification of the computer code SEPHIS, has been used successfully to calculate solute behaviour in mixer-settler experiments. It also accounts for the oxidation of Pu (III) in the organic phase although improvements to this part of the code could be made when the kinetics of the oxidation are established.

31665 Improvements in thorium-uranium separation in the Acid-Thorex process. Benedict, G.E. (General Atomic Co., San Diego, CA). Contract DE-AT03-76SF1053. pp 371-377 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

In the Acid-Thorex process, fluoride ion should be added to the thorium partitioning solution (1BX) to decrease thorium transfer to the uranium stripping column, particularly where highly radioactive feeds are used. This fluoride ion addition then decreases the precipitation of thorium-DBP in the uranium tripping column. Also, the partition cycle should be the first cycle in the Acid-Thorex process to allow separation of thorium from DBP.

31666 Dissolution of plutonium dioxide: a critical review. Ryan, J.L.; Bray, L.A. (Pacific Northwest Lab., Richland, WA). pp 499-514 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

Traditional methods of dissolution of PuO_2 do not lend themselves to dissolution of the PuO_2 present in irradiated reactor fuels when it is not in solid solution with UO_2. Plutonium dioxide is insoluble both from a thermodynamic and kinetic standpoint in the terminal nitric acid concentrations desired for dissolver solutions. Pyrochemical dissolution methods would be very difficult with the high activity levels involved and would generally add appreciably to high level waste volumes. Use of nitric acid-hydrofluoric acid at tolerable levels of fluoride is severely limited by fluoride complexing by uranium and fission products. In dissolution in HNO_3 solutions of Ce(IV), various fission products consume Ce(IV). Despite this, the lack of other desirable alternatives makes it appear that further work on oxidative dissolution might be warranted.

31667 Separation of long-lived α-emitters from highly radioactive solutions in the thorium-uranium fuel cycle. Wenzel, U.; Branquinho, C.L.; Herz, D.; Ritter, G. (Institute of Chemical Technology, Kernforschungsanlage Julich, Germany). pp 533-545 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

In the Th-U fuel cycle, Np and Pu are valueless components of the spent fuel. They have to be considered, however, during the spent nuclear fuel management. Both elements can be guided simultaneously into definite process streams by stabilizing extractable oxidation states during the reprocessing of spent Th-U fuel. With respect to an actinide separation, the intermediate Th-U product and the predecontaminated waste of the second THOREX-cycle are the best suited starting solutions. An extraction chromatographic process is suggested as separation method and its technical implementation is presented for the purification of the reprocessing end streams from Np and Pu. 5 figures, 5 tables.

TRANSPORT AND STORAGE

REFER ALSO TO CITATION(S) 31679, 32687

31668 (LA—8463-MS) Irradiated fuel inspection in a storage pond with no fuel movement and an uncollimated detector. Rinard, P.M. (Los Alamos Scientific Lab., NM (USA)). Jul 1980. Contract W-7405-ENG-36. 25p. NTIS, PC A02/MF A01.

It is assumed that the assemblies are not to be moved during the inspection in order to reduce the time required. The task is simplified further when the detector is well collimated. If the collimation is insufficient to respond to only one assembly from among an array of fuel assemblies, then an unfolding process is needed. A formulation of the detector's behavior is given followed by an unfolding process to yield the detector's response to each assembly as if it were isolated. Some simulated arrays are used to illustrate the sensitivity of the procedure to normal fluctuations in the measured quantities. Measurements with an ionization chamber on actual arrays of up to fourteen PWR assemblies are treated to provide a realistic application of the unfolding process. An unfolding technique is essential with a poorly collimated detector, but the examples warn that weak source strengths surrounded by much stronger sources will not be accurately recovered and even the detection of voids is thus uncertain. Some simulated arrays of up to 100 assemblies indicate that unacceptably inaccurate results may be caused by even the small normal fluctuations in measured values. Any use of an unfolding process is thus quite limited.

31669 (UCID—18629) Stressmeter placement at spent fuel test in climax granite. Abey, A.E.; Washington, H.R. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 20 May 1980. Contract W-7405-ENG-48. 20p. NTIS, PC A02/MF A01.

Vibrating wire stressmeters were installed in the Spent Fuel Facility at the Nevada Test Site. These stressmeters will measure the changes in in situ stress during the five-year spent fuel test. Before installation, laboratory tests were conducted to study reproducibility of placement and to develop a program hopefully to reduce corrosion of the stressmeters while in place at the Spent Fuel Facility. These laboratory tests are discussed along with the installation of the stressmeters at the Spent Fuel Facility.

WASTE MANAGEMENT

REFER ALSO TO CITATION(S) 31693, 31708, 32780

31670 (DP—79-125-4) Waste Management Program. Technical progress report, October-December 1979. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Jul 1980. Contract AC09-76SR00001. 54p. NTIS, PC A04/MF A01.

This quarterly report provides current information on operations and development programs for the management of radioactive wastes from the operation of the Savannah River Plant. The research and development progress and operational status are reported for separation and concentration studies, process and equipment development, surveillance and maintenance of waste tanks, waste concentration, waste tank evaluation, tank replacement/waste transfer (formerly waste tank retirement), and development of criteria for the selection of sites for storage of waste forms produced in the Defense Waste Processing Facility.

31671 (K/OP—248) **PLOTLIB: a computerized nuclear waste source-term library storage and retrieval system.** Marshall, J.R.; Nowicki, J.A. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). 31 Mar 1978. Contract W-7405-ENG-26. 83p. NTIS, PC A05/MF A01.

The PLOTLIB code was written to provide computer access to the Nuclear Waste Source-Term Library for those users with little previous computer programming experience. The principles of user orientation, quick accessibility, and versatility were extensively employed in the development of the PLOTLIB code to accomplish this goal. The Nuclear Waste Source-Term Library consists of 16 ORIGEN computer runs incorporating a wide variety of differing light water reactor (LWR) fuel cycles and waste streams. The typical isotopic source-term data consist of information on watts, curies, grams, etc., all of which are compiled as a function of time after reactor discharge and unitized on a per metric ton heavy metal basis. The information retrieval code, PLOTLIB, is used to process source-term information requests into computer plots and/or user-specified output tables. This report will serve both as documentation of the current data library and as an operations manual for the PLOTLIB computer code. The accompanying input description, program listing, and sample problems make this code package an easily understood tool for the various nuclear waste studies under way at the Office of Waste Isolation.

31672 (PNL—3425) **Wastes from selected activities in two light-water reactor fuel cycles.** Palmer, C.R.; Hill, O.F. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jul 1980. Contract AC06-76RL01830. 45p. NTIS, PC A03/MF A01.

This report presents projected volumes and radioactivities of wastes from the production of electrical energy using light-water reactors (LWR). The projections are based upon data developed for a recent environmental impact statement in which the transuranic wastes (i.e., those wastes containing certain long-lived alpha emitters at concentrations of at least 370 becquerels, or 10 nCi, per gram of waste) from fuel cycle activities were characterized. In addition, since the WG.7 assumed that all fuel cycle wastes except mill tailings are placed in a mined geologic repository, the nontransuranic wastes from several activities are included in the projections reported. The LWR fuel cycles considered are the LWR, once-through fuel cycle (Strategy 1), in which spent fuel is packaged in metal canisters and then isolated in geologic formations; and the LWR U/Pu recycle fuel cycle (Strategy 2), wherein spent fuel is reprocessed for recovery and recycle of uranium and plutonium in LWRs. The wastes projected for the two LWR fuel cycles are summarized. The reactor operations and decommissioning were found to dominate the rate of waste generation in each cycle. These activities account for at least 85% of the fuel cycle waste volume (not including head-end wastes) when normalized to per unit electrical energy generated. At 10 years out of reactor, however, spent fuel elements in Strategy 1 represent 98% of the fuel cycle activity but only 4% of the volume. Similarly, the packaged high-level waste, fuel hulls and hardware in Strategy 2 concentrate greater than 95% of the activity in 2% of the waste volume.

31673 **Polymolybdates as plutonium (IV) hosts.** Penneman, R.A. (Los Alamos Scientific Lab., NM); Haire, R.G.; Lloyd, M.H. pp 571-581 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

Plutonium molybdate precipitated in the absence of Zr is a different structure (isostructural with $U(MoO_4)_2$ than the $ZrMo_2O_7(OH)_2(H_2O)_2$ whose structure was determined by Clearfield and Blessing. Because of the difference between Pu-O and Zr-O bond lengths (Δ=0.14A) at the same bond strength, it is expected that the $ZrMo_2O_7(OH)_2(H_2O)_2$ lattice will not accommodate extensive substitution of the larger Pu(IV) for Zr(IV). The plutonium-bearing precipitate obtained from nitric acid solutions (containing molybdenum, zirconium and plutonium) gives an x-ray powder diffraction pattern not distinguishable from that of $ZrMo_2O_7(OH)_2(H_2O)_2$ precipitated without plutonium. However, since the Pu content is low, the Pu could be present either in the Pu molybdate structure or replacing Zr in the Zr molybdate structure and not be detected in the x-ray patterns. Present data on the Zr and Pu molybdates have not provided evidence for the existence of heteropoly molybdate structures for those precipitates obtained from 1-5M HNO_3. Zachariasen's empirical rules relating bond strengths and bond lengths in 4f and 5f oxides is demonstrated to be useful when applied to the simple and complex molybdate structures.

WASTE PROCESSING

REFER ALSO TO CITATION(S) 31650, 31663, 32646

31674 (CONF-791234—7) **INEL waste cleanup.** Chapin, J.A. (EG and G Idaho, Inc., Idaho Falls (USA)). 1979. Contract AC07-76ID01570. 41p. NTIS, PC A03/MF A01.

From Environmental decontamination workshop; Oak Ridge, TN, USA (4 Dec 1979).

Decommissioning and decontamination activities at the Idaho National Engineering Laboratory are discussed. The projects planned and completed are presented. Problems encountered on these projects are discussed. A developmental program is recommended. Contaminated areas consist of test reactors, reactor support facilities, a fuel reprocessing facility and various soil areas. One D and D project in 1960 occurred as a result of an accident at a low-power reactor in which 3 persons were killed, the reactor and containment building were destroyed, and large areas of land were contaminated. (DC)

31675 (DP—80-157-1) **Long-term high-level waste technology. Composite quarterly technical report, January-March 1980.** Cornman, W.R. (comp.). (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Jul 1980. Contract AC09-76SR00001. 58p. NTIS, PC A04/MF A01.

This composite quarterly technical report summarizes work performed at participating sites to immobilize high-level radioactive wastes. This work is under the direction of the Savannah River Operations Office of the Department of Energy (DOE-SR). The Savannah River Laboratory, operated by E. I. du Pont de Nemours and Co. for the US Department of Energy, is serving as the lead office for this program to provide technical assistance to DOE-SR and to coordinate work done at the participating sites. This series of reports summarizes research and development studies on the immobilization of high-level wastes from the chemical reprocessing of nuclear reactor fuels. Immobilization of the wastes (defense and commercial) consists of placing them in a high-integrity form with a very low potential for radionuclide release. Immobilization of commercial wastes is being considered on a contingency basis in the event that reprocessing is resumed. The basic plan for meeting the goal of immobilization of the DOE high-level wastes is: (1) to develop technology to support a realistic choice of waste form alternatives for each of the three DOE sites; (2) to develop product and processing technology with sufficient scaleup to provide design data for full-scale facilities; and (3) to construct and operate the facilities.

31676 (DP—1553) **Vitrification of transuranic and beta-gamma contaminated solid wastes.** Dukes, M.D. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Jun 1980. Contract AC09-76SR00001. 19p. NTIS, PC A02/MF A01.

Vitrification of solid transuranic contaminated (TRU) wastes alone and with high-level liquid wastes (HLLW) was studied. Homogeneous glasses containing 20 to 30 wt % ash were made by using glass frits previously developed at the Savannah River Plant and Pacific Northwest Laboratories. If the ash is vitrified along with the HLLW, 1.0 wt % as can be added to the waste forms without affecting their quality. This loading of ash is well above the loading required by the relative amounts of HLLW and TRU ash that will be processed at the Savannah River Plant. Vitrification of TRU-contaminated electropolishing sludges and high efficiency particular air filter materials along with HLLW would require an increase in the quantity of glass to be produced. However, if these TRU-contaminated solids were vitrified with the HLLW, the addition of low-level beta-gamma contaminated ash would require no further increase in glass production.

31677 (DP-MS—79-108) **Design and operation of small-scale glass melters for immobilizing radioactive waste.** Plodinec, M.J.; Chismar, P.H. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1980. Contract AC09-76SR00001. 6p. (CONF-800914—1). NTIS, PC A02/MF A01.

From IEEE meeting; Cincinnati, OH, USA (29 Sep 1980).

A small-scale (3-kg), joule-heated, continuous melter has been designed to study vitrification of Savannah River Plant radioactive waste. The first melter built has been in nonradioactive service for nearly three years. This melter had Inconel 690 electrodes and uses Monofrax K-3 for the contact refractory. Several problems seem in this melter have had an impact on the design of a full-scale system. Problems include uncontrolled electric currents passing through the throat, and formation of a slag layer at the bottom of the melter. The performance of a similar melter in a low-maintenance, radioactive environment is also described. Problems such as halide refluxing, and hot streaking, first observed in this melter, are also discussed.

31678 (ENICO—1038) **Properties of vitrified ICPP zirconia calcine.** Cole, H.S.; Gombert, D. II; Berreth, J.R. (Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA)). Jul 1980. Contract AC07-79ID01675. 40p. NTIS, PC A03/MF A01.

Waste glass using a borosilicate frit and simulated zirconia calcine produced at the Idaho Chemical Processing Plant was characterized. Tests included: Soxhlet, acid, and static distilled water leaches, and relative viscosity and crystallinity measurements on both air-quenched and annealed samples. The frit was evaluated to vitrify 10 to 40 wt% calcine. The effects of CaF_2 content on glass viscosity and crystallinity were measured. Changes in viscosity and leach rate caused by other calcines, partially substituted for the zirconia calcine in the glass, were determined. Varying the Na_2O to Li_2O ratio was studied on four modifications of the base glass. Viscosity and leach rates of glasses modified as described above were not significantly altered, but crystalline content of heat-treated glasses significantly increased with increasing CaF_2 content. 10 figures, 11 tables.

31679 (ONWI—62) **Proceedings of the National Waste Terminal Storage Program information meeting.** (Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation). 30 Oct 1979. Contract AC06-76RL01830. 235p. (CONF-791033—). NTIS, PC A11/MF A01.

From 1. annual ONWI information meeting; Columbus, OH, USA (30 Oct 1979).

This document is a compilation of papers presented at an NWTS information meeting designed to provide a comprehensive review of the progress of the ONWI program as well as an overview of the BWIP (Basalt Waste Isolation Project) program and NNWSI (Nevada Nuclear Waste Storage Investigations). The papers are arranged into seven sections: overview of NWTS program, science/technology studies, geologic studies for site identification program, process/equipment program, systems analysis, site/repository licensing, and facilities engineering. (DLC)

31680 (PNL—3145) **Vitrification of radioactive high-level waste by spray calcination and in-can melting.** Hanson, M.S.; Bjorklund, W.J. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jul 1980. Contract AC06-76RL01830. 87p. NTIS, PC A05/MF A01.

After several nonradioactive test runs, radioactive waste from the processing of 1.5 t of spent, light-water-reactor fuel was successfully concentrated, dried and converted to a vitreous product. A total of 97 L of waste glass (in two stainless steel canisters) was produced. The spray calcination process coupled to the in-can melting process, as developed at Pacific Northwest Laboratory, was used to vitrify the waste. An effluent system consisting of a variety of condensation of scrubbing steps more than adequately decontaminated the process off gas before it was released to the atmosphere.

31681 (PNL—3405) **In-can melting demonstration of wastes from the Idaho Chemical Processing Plant.** Bjorklund, W.J.; Chick, L.A.; Hollis, H.H.; Mellinger, G.B.; Nelson, T.A.; Petkus, L.L. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jul 1980. Contract AC06-76RL01830. 58p. NTIS, PC A04/MF A01.

The immobilization of Idaho Chemical Processing Plant (ICPP) zirconia calcine using Idaho glass composition (ICPP-127) was evaluated at Pacific Northwest Laboratory (PNL) in two engineering-scale in-can melter tests. The glass was initially characterized in the laboratory to verify processing parameters. Glass was then produced in a pilot-scale melter and then in a full-scale melter to evaluate the processing and the resultant product. Potential corrosion problems were identified with the glass and some processing problems were encountered, but neither is insurmountable. The product is a durable leach-resistant glass. The glass appears to be nonhomogeneous, but chemically it is quite uniform.

31682 (RFP—2969) **Evaluation of refractory materials for a nuclear waste incinerator.** Grotzky, V.K.; Kneale, P.A.; Teter, A.R. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 21 Jul 1980. Contract AC04-76DP03533. 45p. NTIS, PC A03/MF A01.

An experiment to find a suitable refractory lining for a nuclear waste incinerator has been completed. Eleven brick and six castable products were analyzed by optical and scanning microscopy. All the materials were fashioned into cup shapes and subjected to temperatures ranging from 800 to 1200°C for as long as six weeks. Some of the cups were charged weekly with pellets made from ash materials that would contact an incinerator liner. Refractory products containing a high percentage of aluminum oxide had the greatest resistance to cracking and slag buildup. 35 figures.

31683 (RHO-F—7) **Cell 18 ion exchange flowsheet.** Poling, W.E. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). Jan 1980. Contract AC06-77RL01030. 54p. NTIS, PC A04/MF A01.

Objective is to remove cation impurities from the crude cesium nitrate waste solutions currently stored in B Plant in preparation for final purification in the Cell 38 cesium purification process. Clarified solutions from the crude product centrifugation, solids leach process, and flushes are processed through the ion exchange column in Cell 18 to separate cesium from metallic cation impurities, and to produce a cesium carbonate solution acceptable for final cesium purification feed. Process losses in the ion exchange portion of less than 0.05% are projected. Product generated by the ion exchange process is concentrated and transferred to Cell 37 as cesium carbonate solution. This product is solids free, and has a pH of about 10.5, which is within the desired purification feed pH range. Aluminum and iron decontamination in the clarification process from the cesium is expected to be sufficient to preclude solids formation in the concentrated ion exchange product and hence in the feed makeup step in the purification process. The carbonate solution will be sampled after concentration to verify low solids content. If excessive solids are detected, the product may be clarified for solids removal prior to final purification in Cell 38.

31684 (RHO-F—8) **Ion exchange flowsheet for final purification of B plant cesium.** Carlstrom, R.F. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). Jan 1980. Contract AC06-77RL01030. 42p. NTIS, PC A03/MF A01.

The primary objective of the final cesium purification process is to produce a cesium carbonate product suitable for the encapsulation process. The encapsulation specifications are designed to minimize the volume of material to be encapsulated and control corrosion rates by assuring that the salt remains in the solid form. The feed for the cesium purification process is transferred from storage in Cell 37 to Cell 38. The feed is diluted with demineralized water and is loaded onto the ion exchange bed. The impurity cations (sodium, potassium, and rubidium) are removed (scrubbed) from the bed with a dilute ammonium carbonate-ammonium hydroxide solution passed through the bed in the same flow direction as the loading step. The cesium is removed from the ion exchange bed with a concentrated ammonium carbonate-ammonium hydroxide solution passed counterflow through the bed and the resulting product is concentrated. The concentrated cesium product is transferred to storage as available feed for the cesium encapsulation process.

31685 **EPR investigations of Gd^{3+} in single crystals and powders of the zircon—structure orthophosphates YPO_4, $ScPO_4$, and $LuPO_4$.** Rappaz, M.; Boatner, L.A.; Abraham, M.M. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *J. Chem. Phys.*; **73**: No. 3, 1095-1103(1 Aug 1980).

The tetragonal xenotime (YPO_4) and monoclinic monazite ($CePO_4$) orthophosphates are known to be chemically and physically stable in geological environments and are also radiation resistant. For these reasons, materials of this type are currently candidates for the primary containment of radioactive actinide solid wastes. Single crystals of the tetragonal orthophosphates YPO_4, $ScPO_4$, and $LuPO_4$ doped with Gd^{3+} were grown by slowly cooling a $Pb_2P_2O_7$ flux. Finely divided (<0.1 μ), rare-earth-doped powders of these materials were also prepared using a technique of precipitation in molten urea. Electron paramagnetic resonance investigations have shown that the Gd^{3+} impurities occupy identical substitutional sites in both single crystal and powder specimens of the tetragonal-symmetry orthophosphates. These results provide a basis for future investigations of the effects of heavy-particle radiation damage in the lanthanide orthophosphates.

31686 **Actinide partitioning flowsheets.** Tedder, D.D.; Finney, B.C.; Blomeke, J.O. (Oak Ridge National Lab., TN). pp 381-393 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

The actinide partitioning program will show that alpha-bearing wastes can probably be partitioned to a level that would significantly reduce the acitinide concentrations in the resulting wastes. Also, the waste quantities would not be greatly increased because of waste treatment facility (WTF) operation. No increase in HL glass quantities is anticipated. The LL and IL fuel reprocessing concrete wastes would increase about 25% in volume while the fuel fabrication waste volumes would increase about 16% with these flowsheets. However, the WTF that partitions fuel reprocessing wastes may actually be larger in size than the main reprocessing plant itself. It appears technically feasible to develop chemical systems for dealing with all types of alpha wastes, but these treatment systems are themselves highly complex. A simple Purex plant only uses one solvent (i.e. TBP); a WTF would utilize at least three different solvents (i.e. TBP, CMP, and 2-ethylhexanol). In addition, the WTF would require complex mechanical hot cells to treat HEPA filter wastes and incinerator ashes, as well as operate a bank of cation exchange chromatography columns. Although the CEC system might be replaced with an equivalent solvent extraction cycle, this improvement would be small since the resulting WTF would then be utilizing four different solvents.

31687 **Flowsheet development work at the Idaho Chemical Processing plant for the partitioning of actinides from acidic nuclear waste.**

McIsaac, L.D.; Baker, J.D.; Krupa, J.F.; Meikrantz, D.H.; Schroeder, N.C. (Allied Chemical Corp., Idaho Falls, ID). pp 395-410 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

The chemical composition of acid ICPP waste is discussed. The ICPP actinide partitioning program and its latest findings are summarized. DHDECMP and DBDECMP were evaluated as extractants. The problem of mercury extraction and stripping is considered. The flowsheet is outlined. Mini-mixer-settler tests were run, and cold pilot-plant tests are in progress. 6 tables, 3 figures. (DLC)

31688 Recovery of by-product actinides from power reactor fuels and production of heat source isotopes. Koch, G. (Kernforshungszentrum Karlsruhe, Germany). pp 411-425 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

This paper reviews the processes which were designed by Institut fuer Heisse Chemie for the recovery of raw-material actinides from power reactor fuels and for the production of heat-source isotopes, and describes the state of development which has been reached. These processes include ^{237}Np recovery in WAK plant, recovery of $^{241-243}Am$ and ^{244}Cm from high-level waste, ^{241}Am recovery from Pu scrap, ^{238}Pu recovery from irradiated ^{237}Np, and production of medical-grade ^{238}Pu from irradiated ^{241}Am. 3 figures. (DLC)

31689 Separation of actinides from Purex-type high active waste raffinates: development of experimental studies at JRC-ISPRA establishment. Cecille, L.; Dworschak, H.; Girardi, F.; Hunt, B.A. (JRC-ISPRA Establishment, Varese, Italy). pp 427-440 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

On the basis of the laboratory indications presently available, all three proposed partitioning processes appear to be feasible and to have the potential for removing actinides from HAW (TBP, HDEHP, OXAL) up to the necessary level. Additional data on the actinide losses to the various secondary waste streams, on the radiation stability of the chemicals used for stripping operations, as well as on their recycle or removal as wastes still need to be obtained on laboratory scale for fully active HAW. The obtained results will provide the basis for deciding whether to proceed or not to a pilot plant scale experimentation. Until such experiments are performed it will be impossible to demonstrate the overall feasibility of the selected partitioning process with an acceptable degree of reliability. 3 figures, 4 tables.

31690 Separation of actinides from high active waste by means of counter current ion migration. Bilal, B.A.; Herrmann, F.; Metscher, K.; Muehlig, B.; Reichmuth, C.; Schwarz, B. (Hahn-Meitner-Insitut fuer Kernforshung, Berlin, Germany). pp 561-569 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

In the countercurrent ion migration process, the actinides in the waste are separated in one stage with a high decontamination factor ($\sim 10^6$). The aqueous medium is less radiosensitive. Principles of the migration process and the processing of high active waste are discussed. Discontinuous and continuous separation of the actinides from the waste are considered. The energy necessary for this separation is estimated to be $\sim 10^{-5}$ of the energy gained in the fuel in a LWR. (DLC)

WASTE DISPOSAL AND STORAGE

REFER ALSO TO CITATION(S) 31669, 32276, 32890

31691 (ANL—80-36) **Studies of nuclear waste migration in geologic media. Annual report, October 1978-September 1979.** Seitz, M.G.; Rickert, P.G.; Couture, R.A.; Williams, J.; Meldgin, N.; Fried, S.M.; Friedman, A.M.; Steindler, M.J. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 66p. NTIS, PC A04/MF A01.

Experimental results obtained this year confirm the results obtained in previous years - that nuclides migrating by fluid flow in rock often exhibit complex behavior not predicted by simple chromatographic-type models. A phenomenon found previously to lead to complex behavior for leached radionuclides is that the amount of adsorbed nuclide was not proportional to the nuclide concentration in solution (nonlinear adsorption isotherm). For cesium adsorption on limestone and on basalt, nonlinear isotherms were found this year to occur in the range of cesium concentrations in the groundwater of about 10^{-3} to 10^{-9}M. Because cesium concentrations in this range can readily be attained by the leaching of solid waste by groundwater, the effects of nonlinear isotherms are germane to nuclide migration. This dependence of cesium migration on the leached concentration of cesium emphasizes the importance of treating the leaching and migration processes simultaneously such as is done in the leach-migration experiments performed in this work. The existence of nonlinear isotherms precludes the use of a single partition coefficient (K/sub d/) to describe cesium migration at an arbitrary cesium concentration above 10^{-9}M. Nonetheless, nonlinear isotherms can be studied experimentally (e.g., to give K/sub d/ as a function of concentration) and effects of nonlinear adsorption can be predicted quantitatively. Comparison of results from column and batch tests indicate that, in addition to nonlinear adsorption, kinetic effects need to be considered in predicting nuclide migration from the partition coefficients measured in batch tests. Results of batch experiments of 2 weeks or longer duration pertained to migration expected only at the very lowest (< 50 m/y) groundwater flow rates of interest.

31692 (DOE/RL/C—14) **Report on geologic exploration activities.** (Battelle Memorial Inst., Columbus, OH (USA). Office of Nuclear Waste Isolation). Jan 1980. Contract AC06-76RL01830. 83p. NTIS, PC A05/MF A01.

This report provides an overview of the geological exploration activities being carried out as part of the National Waste Terminal Storage (NWTS) Program, which has been established by the US Department of Energy (DOE) to develop the technology and provide the facilities for the safe, environmentally acceptable isolation of civilian high-level and transuranic nuclear wastes, including spent fuel elements, for which the Federal government is reponsible. The principal programmatic emphasis is on disposal in mined geologic repositories. Explorations are being conducted or planned in various parts of the country to identify potential sites for such repositories. The work is being undertaken by three separate but coordinated NWTS project elements. Under the Basalt Waste Isolation Project (BWIP), basalt formations underlying DOE's Hanford Reservation are being investigated. Granite, tuff, and shale formations at the DOE Nevada Test Site (NTS) are being similarly studied in the Nevada Nuclear Waste Storage Investigations (NNWSI). The Office of Nuclear Waste Isolation (ONWI) is investigating domed salt formations in several Gulf Coast states and bedded salt formations in Utah and Texas. Th ONWI siting studies are being expanded to include areas overlying crystalline rocks, shales, and other geohydrologic systems. The current status of these NWTS efforts, including the projected budgets for FY 1981, is summarized, and the criteria and methodology being employed in the explorations are described. The consistency of the overall effort with the recommendations presented in the Report to the President by the Interagency Review Group on Nuclear Waste Management (IRG), as well as with documents representing the national technical consensus, is discussed.

31693 (LA—8422-MS) **Radiochemical analyses of samples from beneath a solid radioactive waste disposal pit at Los Alamos, New Mexico.** Purtymun, W.D.; Rogers, M.A.; Wheeler, M.L. (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 18p. NTIS, PC A02/MF A01.

Solid radioactive wastes are disposed of by burial in pits excavated in rhyolite tuff at the Los Alamos Scientific Laboratory (LASL). Contaminants in the waste include fission products, uranium, and transuranic elements. In 1976, horizontal core holes were drilled beneath a waste disposal pit that was used from 1963 to 1966. Samples of the core were analyzed for gross alpha, gross beta, total uranium, ^{90}Sr, ^{137}Cs, ^{238}Pu, $^{239,240}Pu$, and ^{241}Am. The measured gross alpha, gross beta, and uranium concentrations were above minimum detection limits; concentrations of the remaining radionuclides, all of which are man-made isotopes, were below the minimum detection limits. Statistical comparisons were made of the gross alpha, gross beta, and uranium data to identify any significant variations from natural concentrations in the tuff. The comparisons demonstrated that none of the radioactivity detected in the samples can be attributed to migration from the disposal pit.

31694 (LBL—9677) **Study of rock-water-nuclear waste interactions in the Pasco Basin, Washington. Part I. Distribution and composition of secondary and primary mineral phases in basalts of the Pasco Basin, Washington.** Benson, L.V.; Teague, L.S. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Sep 1979. Contract W-7405-ENG-48. 157p. NTIS, PC A08/MF A01.

In Part I of this report the results of Task III are presented and discussed. The subject of Task III is the study and identification of secondary and primary mineral assemblages in basalts of the Pasco Basin of southeastern Washington. In particular, we have determined the relative amounts, crystallization sequence, and compositions of secondary minerals found lining vesicle and fracture surfaces. This information, together with data on the chemical composition of primary minerals and the extent to which they have

undergone dissolution, has been used in theoretical simulations of mass transfer which is the subject of Part II (Task IV) of this report.

31695 (NVO—196-16) **Nevada Nuclear Waste Storage Investigations. FY 1979 peer review summaries and related documentation.** (Department of Energy, Las Vegas, NV (USA). Nevada Operations Office). Jun 1980. 192p. NTIS, PC A09/MF A01.

The NNWSI FY 1979 Project Plan (NVO-196-9) describes the accomplishment plan and objectives of the FY 1979 investigations. Three critical tasks and one critical subtask were selected by Project management for in-depth external peer review at meetings held at the DOE/NV in Las Vegas. The four technical peer review meetings held during FY 1979 were conducted to obtain an external assessment of the sufficiency and quality of the four selected critical investigative segments of the NNWSI. Peer reviewers representing appropriate fields of expertise were invited to attend each meeting. Within about two weeks of each meeting, the invited reviewers summarized their impressions of the technical activities presented to them and transmitted their summaries and recommendations to DOE/NV by letter. This document is a compilation, according to the individual meetings, of all correspondence between reviewers and Project personnel that is relevant to the technical activities of the NNWSI. The section for each meeting briefly summarizes the major activities of the NNWSI being reviewed and the effects of the reviewers comments and recommendations on Project planning. Each section also includes a list of the invited peer reviewers, a meeting agenda, and a copy of all technical correspondence relating to the review meeting. General impressions of the overall peer review process and improvements to be incorporated into future peer review activities are discussed in the next section as an introduction to the four subsequent sections which are devoted to the individual FY 1979 peer reviews.

31696 (PNL—3179) **Multicomponent mass transport model: a model for simulating migration of radionuclides in ground water.** Washburn, J.F.; Kaszeta, F.E.; Simmons, C.S.; Cole, C.R. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Jul 1980. Contract AC06-76RL01830. 120p. NTIS, PC A06/MF A01.

This report presents the results of the development of a one-dimensional radionuclide transport code, MMT2D (Multicomponent Mass Transport), for the AEGIS Program. Multicomponent Mass Transport is a numerical solution technique that uses the discrete-parcel-random-wald (DPRW) method to directly simulate the migration of radionuclides. MMT1D accounts for: convection;dispersion; sorption-desorption; first-order radioactive decay; and n-membered radioactive decay chains. Comparisons between MMT1D and an analytical solution for a similar problem show that: MMT1D agrees very closely with the analytical solution; MMT1D has no cumulative numerical dispersion like that associated with solution techniques such as finite differences and finite elements; for current AEGIS applications, relatively few parcels are required to produce adequate results; and the power of MMT1D is the flexibility of the code in being able to handle complex problems for which analytical solution cannot be obtained. Multicomponent Mass Transport (MMT1D) codes were developed at Pacific Northwest Laboratory to predict the movement of radiocontaminants in the saturated and unsaturated sediments of the Hanford Site. All MMT models require ground-water flow patterns that have been previously generated by a hydrologic model. This report documents the computer code and operating procedures of a third generation of the MMT series: the MMT differs from previous versions by simulating the mass transport processes in systems with radionuclide decay chains. Although MMT is a one-dimensional code, the user is referred to the documentation of the theoretical and numerical procedures of the three-dimensional MMT-DPRW code for discussion of expediency, verification, and error-sensitivity analysis.

31697 (PNL—3349) **Methods for determining radionuclide retardation factors: status report.** Relyea, J.F.; Serne, R.J.; Rai, D. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Apr 1980. Contract AC06-76RL01830. 65p. NTIS, PC A04/MF A01.

This report identifies a number of mechanisms that retard radionuclide migration, and describes the static and dynamic methods that are used to study such retardation phenomena. Both static and dynamic methods are needed for reliable safety assessments of underground nuclear-waste repositories. This report also evaluates the extent to which the two methods may be used to diagnose radionuclide migration through various types of geologic media, among them unconsolidated, crushed, intact, and fractured rocks. Adsorption is one mechanism that can control radionuclide concentrations in solution and therefore impede radionuclide migration. Other mechanisms that control a solution's radionuclide concentration and radionuclide migration are precipitation of hydroxides and oxides, oxidation-reduction reactions, and the formation of minerals that might include the radionuclide as a structural element. The retardation mechanisms mentioned above are controlled by such factors as surface area, cation exchange capacity, solution pH, chemical composition of the rock and of the solution, oxidation-reduction potential, and radionuclide concentration. Rocks and ground waters used in determining retardation factors should represent the expected equilibrium conditions in the geologic system under investigation. Static test methods can be used to rapidly screen the effects of the factors mentioned above. Dynamic (or column) testing, is needed to assess the effects of hydrodynamics and the interaction of hydrodynamics with the other important parameters. This paper proposes both a standard method for conducting batch Kd determinations, and a standard format for organizing and reporting data. Dynamic testing methods are not presently developed to the point that a standard methodology can be proposed. Normal procedures are outlined for column experimentation and the data that are needed to analyze a column experiment are identified.

31698 (RHO-BWI—80-100-2Q) **Basalt Waste Isolation Project. Quarterly report, January 1-March 31, 1980.** Deju, R.A. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Apr 1980. Contract AC06-77RL01030. 94p. NTIS, PC A05/MF A01.

This report addresses the technical progress for the Basalt Waste Isolation Project for the second quarter of fiscal year 1980. Seismic design values were developed for preliminary repository design purposes; 0.25 g horizontal and 0.125 g vertical maximum accelerations for surface, zero-period conditions. Preliminary seismic data indicate broad, smooth areas exist in the bedrock surface in the western portion of the Cold Creek syncline and a gently undulating bedrock surface in the eastern portion. Test results indicate hydraulic property values fall within the range previously reported for sedimentary and interflow zones in basalt formations at the Hanford Site. Preliminary results of available hydrochemical data obtained from several borehole sites indicate that little, if any, vertical mixing of groundwaters is taking place across this stratigraphic boundary. Multiple barrier studies indicate that the primary candidate canister/overpack alloys are TiCode-12, Inconel 625, Incoloy 825, and Zircaloy 2. Low-carbon steel and cast iron are among the list of secondary candidate canister alloys. Laboratory tests of borehole plug designs have shown that it is feasible to design a composite plug system that will satisfactorily seal a nuclear waste repository in Columbia River basalt. The National Lead Industries, Inc., NLI-1/2 Universal Spent Fuel Shipping Cask was selected for use in Phase II operations. Creep test results of samples of Umtanum basalt from borehole DC-6 were plotted and show the day-to-day variation in deformation versus time. The concept selection phase of repository conceptual design was completed in March 1980. A test plan for the Exploratory Shaft Test Facility was developed and is scheduled for submittal to the US Department of Energy in May 1980.

31699 (RHO-BWI-ST—9) **Identification of key radionuclides in a nuclear waste repository in basalt.** Barney, G.S.; Wood, B.J. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). May 1980. Contract AC06-77RL01030. 33p. NTIS, PC A03/MF A01.

Radionuclides were identified which appear to pose the greatest potential hazard to man during long-term storage of nuclear waste in a repository mined in the Columbia Plateau basalt formation. The criteria used to select key radionuclides were as follows: quantity of radionuclide in stored waste; biological toxicity; leach rate of the wastes into groundwater; and transport rate via groundwater flow. The waste forms were assumed to be either unreprocessed spent fuel or borosilicate glass containing reprocessed high-level waste. The nuclear waste composition was assumed to be that from a light water reactor. Radionuclides were ranked according to quantity, toxicity, and release rate from the repository. These rankings were combined to obtain a single list of key radionuclides. The ten most important radionuclides in order of decreasing hazard are: ^{99}Tc, ^{129}I, ^{237}Np, ^{226}Ra, ^{107}Pd, ^{230}Th, ^{210}Pb, ^{126}Sn, ^{79}Se, and ^{242}Pu. Safety assessment studies and the design of engineered barriers should concentrate on containment of radionuclides in this list.

31700 (RHO-CD—882) **Inspection and evaluation of Nuclear Fuel Services high-level waste storage system. Program plan.** (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Jan 1980. Contract AC06-77RL01030. 64p. NTIS, PC A04/MF A01.

The Nuclear Regulatory Commission has expressed the need for additional information concerning the condition of the high-level waste tanks at the Western New York State Nuclear Service center near West Valley, New York. This information is intended to be used in evaluating the safety of continued storage and in the development of alternatives for final disposition of the high-level waste.

31701 (SAND—79-2117) **Biological ramifications of the subseabed disposal of high-level nuclear waste.** Gomez, L.S.; Hessler, R.R.; Jackson, D.W.; Marietta, M.G.; Smith, K.L. Jr.; Talbert, D.M.; Yayanos, A.A. (Sandia National Labs., Albuquerque, NM (USA)). May 1980. Contract AC04-76DP00789. 31p. NTIS, PC A03/MF A01.

The primary goal of the US Subseabed Disposal Program (SDP) is to assess the technical and environmental feasibility of disposing of high-level nuclear waste in deep-sea sediments. The

subseabed biology program is charged with assessing possible ecosystem effects of radionuclides as well as possible health effects to man from radionuclides which may be released in the deep sea and transported to the ocean surface. Current biological investigations are attempting to determine benthic community structure; benthic community metabolism; the biology of deep-sea mobile scavengers; the faunal composition of midwater nekton; rates of microbial processes; and the radiation sensitivity of deep-sea organisms. Existing models of the dispersal of radionuclides in the deep sea have not considered many of the possible biological mechanisms which may influence the movement of radionuclides. Therefore, a multi-compartment foodweb model is being developed which considers both biological and physical influences on radionuclide transport. This model will allow parametric studies to be made of the impact on the ocean environment and on man of potential releases of radionuclides.

31702 (SAND—80-0149) **Comparison of thermomechanical calculations for highly non-linear quasistatic drift deformations.** Wayland, J.R.; Bertholf, L.D. (Sandia National Labs., Albuquerque, NM (USA)). Jul 1980. Contract AC04-76DP00789. 64p. NTIS, PC A04/MF A01.

Results of code calculations for the November 14, 1979, Waste Isolation Pilot Plant (WIPP) Code Benchmark Workshop are compared. The results from five different codes (COUPLEFLO, JAC, SANCHO, SPECTROM, and STEALTH) are given for a problem involving the creep closure of an underground drift. The basic features of the codes are summarized and the codes are evaluated in terms of their applicability to WIPP problems. The codes predicted essentially the same response for this problem, and they appear to be nearly equally applicable to problems of this type. Also, a new benchmark problem is suggested along with a more realistic creep model for bedded salt.

31703 (SAND—80-0304C) **Subseabed Radioactive Waste Disposal Feasibility Program: ocean engineering challenges for the 80's.** Talbert, D.M. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 16p. (CONF-800921—1). NTIS, PC A02/MF A01.

From IEEE/Oceans '80 conference; Seattle, WA, USA (8 Sep 1980).

The objective of the Subseabed Disposal Program is to assess the feasibility of disposing of high-level radioactive wastes or spent fuel in suitable geologic formations beneath the deep ocean floor. The program is entering a phase which will address engineering feasibility. While the current phase of the program to determine the scientific and environmental feasibility of the concept is not yet complete, activities to assess the engineering aspects are being initiated in parallel to facilitate the development of the concept on a time scale commensurate with other related programs both in the United States and abroad. It is anticipated that engineering aspects will become the central focus of the program during the early 80's and will continue so through the establishment of a pilot-plant level activity which could occur by the mid-90's.

31704 (SAND—80-0440) **Systems engineering programs for geologic nuclear waste disposal.** Klett, R.D.; Hertel, E.S. Jr.; Ellis, M.A. (Sandia National Labs., Albuquerque, NM (USA); Dikewood Corp., Albuquerque, NM (USA)). Jun 1980. Contract AC04-76DP00789. 136p. NTIS, PC A07/MF A01.

The design sequence and system programs presented begin with general approximate solutions that permit inexpensive analysis of a multitude of possible wastes, disposal media, and disposal process properties and configurations. It then continues through progressively more precise solutions as parts of the design become fixed, and ends with repository and waste form optimization studies. The programs cover both solid and gaseous waste forms. The analytical development, a program listing, a users guide, and examples are presented for each program. Sensitivity studies showing the effects of disposal media and waste form thermophysical properties and repository layouts are presented as examples.

31705 (SAND—80-0531C) **Application of QA geoscience investigations.** Henderson, J.T. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 10p. (CONF-8005105—1). NTIS, PC A02/MF A01.

From 35. annual technical conference; San Francisco, CA, USA (11 May 1980).

This paper discusses the evolution of a classical hardware QA program (as currently embodied in DOE/ALO Manual Chapter 08XA; NRC 10CFR Part 50, Appendix B; and other similar documents) into the present geoscience quality assurance programs that address eventual NRC licensing, if required. In the context of this paper, QA will be restricted to the tasks associated with nuclear repositories, i.e. site identification, selection, characterization, verification, and utilization.

31706 (UCRL—84643) **Review of the 1979 workshop on thermomechanical modeling for a hard rock waste repository.** Holzer, F. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). 1980. Contract W-7405-ENG-48. 5p. (CONF-800751—2). NTIS, PC A02/MF A01.

From Workshop on thermomechanical-hydrochemical modeling for hardrock waste repository; Bereley, CA, USA (29 Jul 1980).

The 1979 Workshop discussed and considered issues and needs in the areas of Modeling, Laboratory Measurements, Instruments and Field Measurements, and In-situ Tests and Model Validation. A set of conclusions and recommendations was developed, which focused on the necessity of treating the rock mass response to the waste emplaced in it. The conclusions dealt with characterizing the fracture system, determining the mechanical and thermal properties, developing an understanding of the physical process, predicting and measuring the response, and carrying out meaningful validation tests. Measured against the stated objectives, the 1979 Workshop was successful. With respect to implementation of its recommendations, this conclusion is not so obvious, although some activities of the past year suggest the Workshop has had a beneficial influence.

31707 **Process for disposal of aqueous solutions containing radioactive isotopes.** Colombo, P.; Neilson, R.M. Jr.; Becker, W.W. (to Dept. of Energy). US Patent 4,174,293. 13 Nov 1979. Filed date 12 Oct 1977. 8p.

A process for disposing of radioactive aqueous waste solutions whereby the waste solution is utilized as the water of hydration to hydrate densified powdered portland cement in a leakproof container; said waste solution being dispersed without mechanical intermixing in situ in said bulk cement, thereafter the hydrated cement body is impregnated with a mixture of a monomer and polymerization catalyst to form polymer throughout the cement body. The entire process being carried out while maintaining the temperature of the components during the process at a temperature below 99°C. The container containing the solid polymer-impregnated body is thereafter stored at a radioactive waste storage dump such as an underground storage dump. (3 figures)

ENVIRONMENTAL ASPECTS

REFER ALSO TO CITATION(S) 31691, 31699, 31701, 32773, 32785, 32820

31708 (PNL—3253) **Environmental control technology for mining, milling, and refining thorium.** Weakley, S.A.; Blahnik, D.E.; Young, J.K.; Bloomster, C.H. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Feb 1980. Contract AC06-76RL01830. 253p. NTIS, PC A12/MF A01.

The purpose of this report is to evaluate, in terms of cost and effectiveness, the various environmental control technologies that would be used to control the radioactive wastes generated in the mining, milling, and refining of thorium from domestic resources. The technologies, in order to be considered for study, had to reduce the radioactivity in the waste streams to meet Atomic Energy Commission (10 CFR 20) standards for natural thorium's maximum permissible concentration (MPC) in air and water. Further regulatory standards or licensing requirements, either federal, state, or local, were not examined. The availability and cost of producing thorium from domestic resources is addressed in a companion volume. The objectives of this study were: (1) to identify the major waste streams generated during the mining, milling, and refining of reactor-grade thorium oxide from domestic resources; and (2) to determine the cost and levels of control of existing and advanced environmental control technologies for these waste streams. Six potential domestic deposits of thorium oxide, in addition to stockpiled thorium sludges, are discussed in this report. A summary of the location and characteristics of the potential domestic thorium resources and the mining, milling, and refining processes that will be needed to produce reactor-grade thorium oxide is presented in Section 2. The wastes from existing and potential domestic thorium oxide mines, mills, and refineries are identified in Section 3. Section 3 also presents the state-of-the-art technology and the costs associated with controlling the wastes from the mines, mills, and refineries. In Section 4, the available environmental control technologies for mines, mills, and refineries are assessed. Section 5 presents the cost and effectiveness estimates for the various environmental control technologies applicable to the mine, mill, and refinery for each domestic resource.

HEALTH AND SAFETY

REFER ALSO TO CITATION(S) 32670

REGULATIONS

ACCOUNTABILITY AND SAFEGUARDS

REFER ALSO TO CITATION(S) 31668, 32268, 32290

31709 (CONF-800315—21) **Fuel-column imaging in fast critical assembly safeguards.** Brumbach, S.B.; Roche, C.T.; Perry, R.B. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 8p. NTIS, PC A02/MF A01.

From 2. symposium of the European Safeguards Research and Development Association; Edinburgh, UK (26 Mar 1980).

Fissile-material content of fast critical assembly cores may be verified by imaging the fuel columns in the assembly drawers. Photographic film is used to record spatial variations in beta and gamma radiation. Plastic materials and metal foils are used to record spatial variations in fast-neutron flux.

31710 (LA-UR—80-1513) **Los Alamos Scientific Laboratory electronic vehicle identification system.** Landt, J.A.; Bobbett, R.E.; Koelle, A.R.; Salazar, P.H. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 5p. (CONF-800913—1). NTIS, PC A02/MF A01.

From International conference: security through science and engineering; Berlin, F.R. Germany (23 Sep 1980).

A three-digit electronic identification system is described. Digits may be decimal (1000 combinations) or hexidecimal (8192 combinations). Battery-powered transponders are interrogated with a lower-power (1 W) radio signal. Line-of-sight interrogations up to 33 m (100 ft) are possible. Successful interrogations up to 7 m (20 ft) are possible for concealed transponders (that is, in the engine compartment). Vehicles moving at high rates of speed can be interrogated. This system provides data in a computer-compatible RS232 format. The system can be used for other applications with little or no modification. A similar system is in present use for identification and temperature monitoring of livestock. No unforeseen problems exist for expanding the coding scheme to identify larger numbers of objects.

31711 (MLM—2755(OP)) **Method for calibration of plutonium NDA.** Lemming, J.F.; Campbell, A.R.; Rodenburg, W.W. (Mound Facility, Miamisburg, OH (USA)). 1980. Contract AC04-76DP00053. 5p. (CONF-790928—2). NTIS, PC A02/MF A01.

From International meeting on monitoring of Pu-contaminated waste; Ispra, Italy (25 Sep 1979).

Calibration materials characterized by calorimetric assay can be a practical alternative to synthetic standards for the calibration of plutonium nondestructive assay. Calorimetric assay is an effective measurement system for the characterization because: it can give an absolute assay from first principles when the isotopic composition is known, it is insensitive to most matrix effects, and its traceability to international measurement systems has been demonstrated.

31712 (SAND—79-1702) **Adaptive intrusion data system (AIDS) software routines.** Corlis, N.E. (Sandia National Labs., Livermore, CA (USA)). Jul 1980. Contract AC04-76DP00789. 78p. NTIS, PC A05/MF A01.

An Adaptive Intrusion Data System (AIDS) was developed to collect information from intrusion alarm sensors as part of an evaluation system to improve sensor performance. AIDS is a unique digital data-compression, storage, and formatting system; it also incorporates a capability for video selection and recording for assessment of the sensors monitored by the system. The system is software reprogrammable to numerous configurations that may be used for the collection of environmental, bilevel, analog, and video data. This report describes the software routines that control the different AIDS data-collection modes, the diagnostic programs to test the operating hardware, and the data format. Sample data printouts are also included.

31713 (SAND—80-1919C) **Computerized nuclear material system at Sandia National Laboratories.** Tischhauser, J.L. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 14p. (CONF-800655—31). NTIS, PC A02/MF A01.

From 21. annual meeting of the Institute of Nuclear Materials Management; Palm Beach, FL, USA (30 Jun 1980).

SNLA developed and implemented a nuclear material control and accountability system on an HP 3000 minicomputer. The Sandia Nuclear Materials Computer System (SNMCS) which became operative in January 1980 provides: control of shipments and receivals of nuclear material, control of internal transfers of nuclear material, automated inventory with a bar code system, control of inventory adjustments, automated reporting/transmitting to other contractors and operations offices, automated ledgers and journals for material weights and costs, and interface to the Albuquerque Operations Office (ALO) Automated 741 System.

FUSION FUELS

PROCESSING

FABRICATION AND TESTING

31714 **Cryogenic inertial confinement fusion target fabrication system directly operable inside a room-temperature target chamber.** Kim, K.; Rieger, H. (Fusion Technology Laboratory, Department of Electrical Engineering, University of Illinois, Urbana, Illinois 61801). *Appl. Phys. Lett.;* **37**: No. 4, 425-427(15 Aug 1980).

An inertial confinement fusion (ICF) target freezing system, which is capable of fabricating a uniform layer of DT condensate inside a glass microshell, has been developed using cold helium gas jets. The system marks a significant improvement on the existing target freezing systems for the following reasons: first, it does not require cryogenic shields; second, it is directly operable inside a room-temperature target chamber; third, it maintains the integrity of a cryogenic target for as long as desired; fourth, since a bare target can be directly positioned inside the target chamber with no enclosure, implosion of the target using energetic beams (e.g., laser) can easily be achieved at any instant. Description of the system and some results illustrating its performance are presented along with their future applications.

31715 **Fabrication of glass sphere laser fusion targets.** Hendricks, C.D.; Rosencwaig, A.; Woerner, R.L.; Koo, J.C.; Dressler, J.L.; Sherohman, J.W.; Weinland, S.L.; Jeffries, M. (California Univ., Livermore (USA). Lawrence Livermore Lab.). *J. Nucl. Mater.;* **85**: No. 86, 107-111(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

We have developed processes at LLL for mass producing the high quality glass microspheres required for current laser fusion targets. Here we describe the methods and the materials used in our liquid-droplet and dried-gel systems. Glass microspheres ranging from 70-600 microns O.D., with walls from 0.5 to 18 microns thick and which satisfy the exacting surface and symmetry specifications of targets for high density experiments are now produced routinely.

31716 **Low pressure gas filling of laser fusion microspheres.** Koo, J.; Dressler, J.; Hendricks, C. (California Univ., Livermore (USA). Lawrence Livermore Lab.). *J. Nucl. Mater.;* **85**: No. 86, 113-115(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

In our laser fusion microsphere production, large, thin gel-microspheres are formed before the chemicals are fused into glass. In this transient stage, the gel-microspheres are found to be highly permeable to argon and many other inert gases. When the gel transforms to glass, the argon gas, for example, is trapped within to form argon filled, fusion target quality, glass microspheres. On the average, the partial pressure of the argon fills attained in this process is around 2×10^4 Pa at room temperature.

BY-PRODUCTS

31717 (BNL—51212) **Fusion utilization projections in the United States energy economy.** Powell, J.R.; Fillo, J.A. (Brookhaven National Lab., Upton, NY (USA)). Nov 1979. Contract AC02-76CH00016. 89p. NTIS, PC A05/MF A01.

The following topics are discussed in some detail in this report: (1) applications of fusion energy, (2) fusion implementation in the US energy system, (3) reactor performance requirements, (4) technology for electric applications, and (5) technology for synthetic fuel/chemical applications. (MOW)

WASTE MANAGEMENT

31718 (BNL—28067) **HYPERFUSE: a hypervelocity inertial confinement system for fusion energy production and fission waste transmutation.** Makowitz, H.; Powell, J.R.; Wiswall, R. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 19p. (CONF-800743—7). NTIS, PC A02/MF A01.

From International conference on nuclear waste transmutation; Austin, TX, USA (22 Jul 1980).

Parametric system studies of an inertial confinement fusion (ICF) reactor system to transmute fission products from an LWR economy have been carried out. The ICF reactors would produce net power in addition to transmuting fission products. The particular ICF concept examined is an impact fusion approach termed HYPERFUSE, in which hypervelocity pellets, traveling on the order of 100 to 300 km/sec, collide with each other or a target block in :

reactor chamber and initiate a thermonuclear reaction. The DT fusion fuel is contained in a shell of the material to be transmuted, e.g., ^{137}Cs, ^{90}Sr, ^{129}I, ^{99}Tc, etc. The 14-MeV fusion neutrons released during the pellet burn cause transmutation reactions (e.g., (n,2n), (n,α), (n,γ), etc.) that convert the long-lived fission products (FP's) either to stable products or to species that decay with a short half-life to a stable product. The transmutation parametric studies conclude that the design of the hypervelocity projectiles should emphasize the achievement of high densities in the transmutation regions (greater than the DT fusion fuel density), as well as the DT ignition and burn criterion (rho R = 1.0 to 3.0) requirements.

ISOTOPE AND RADIATION SOURCE TECHNOLOGY

PHYSICAL ISOTOPE SEPARATION

31719 Evaluation of quantum and photoproduct yields in multiple-photon dissociation for isotope separation. Herman, I.P. (Physics Department, University of California Lawrence Livermore Laboratory, Livermore, California 94550). W-7405-ENG-48. *J. Appl. Phys.;* 51: No. 8, 4483-4487(Aug 1980).

A model is constructed which evaluates the minority isotope photoproduct yield and the number of photons required per unit product for isotope separation via infrared multiple-photon dissociation by a Gaussian beam. Under most experimental conditions, these parameters are optimized if the peak central fluence is about twice the saturation fluence. The quantum yield and the photoproduct yield are then both about half that attainable if the same laser energy were instead delivered by a beam with a flat transverse profile. Specific applications to deuterium separation are also discussed.

RADIATION SOURCES

31720 (SAND—80-1129) **Beneficial uses program. Progress report ending December 31, 1979.** (Sandia National Labs., Albuquerque, NM (USA)). Jun 1980. Contract AC04-76D000789. 66p. NTIS, PC A04/MF A01.

Progress is reported in research on uses of irradiated sewage sludge, particularly as a cattle feed supplement and commercial fertilizer additive, on potential sites for irradiator demonstration plants, and on the inactivation of enteric bacteria by radiation treatment. (LCL)

DESIGN AND FABRICATION

31721 (GEPP-TIS—508) **Failure analysis of glass-ceramic insulators of shock tested vacuum (neutron) tubes.** Spears, R.K. (General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.). 25 Aug 1980. Contract AC04-76DP00656. 26p. NTIS, PC A03/MF A01.

Eight investigative techniques were used to examine the glass-ceramic insulators in vacuum (neutron) tubes. The insulators were extracted from units that had been subjected to low temperature mechanical shock tests. Two of the three units showed reduced neutron output after these tests and an insulator on one of these two was cracked completely through which probably occurred during shock testing. The objective of this study was to determine if any major differences existed between the insulators of these tubes. After eight analyses, it was concluded that no appreciable differences existed. It appeared that cracking of the one glass-ceramic sample was initiated at inner-sleeve interface voids. For this sample, the interface void density was much higher than is presently acceptable. All insulators were made with glass-ceramic having a Na_2O content of 4.6 wt%. An increased Na_2O content will cause an increase in the coefficient of expansion and will reduce the residual stress level since the molybdenum has a higher coefficient of thermal expansion than the insulator. Thus, it is believed that a decrease in interface voids and an increase in Na_2O should aid in reduced cracking of the insulator during these tests.

OTHER INDUSTRIAL USES

31722 (SAND—79-2240) **Sandis irradiator for dried sewage solids. Final safety analysis report.** Morris, M. (Sandia National Labs., Albuquerque, NM (USA)). Jul 1980. Contract AC04-76DP00789. 132p. NTIS, PC A07/MF A01.

Analyses of the hazards associated with the operation of the Sandia irradiator for dried sewage solids, as well as methods and design considerations to minimize these hazards, are presented in accordance with DOE directives.

ISOTOPIC POWER SUPPLIES

REFER ALSO TO CITATION(S) 32811

31723 (LA—8414-MS) **Study of carbon monoxide production from a multi-hundred watt fuel sphere assembly.** Peterson, D.E.; Pavone, D. (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 21p. NTIS, PC A02/MF A01.

The rate of CO production from a multi-hundred watt fuel sphere assembly was measured as a function of time and temperature in vacuum and helium atmospheres. The generation of CO was shown to be retarded by the presence of helium gas and by continued fuel reductions. Measurements of the exchange rate of isotopically enriched CO with the fuel oxygen indicated that the vents do not restrict the CO production. A small quantity of unidentified second phase was observed in the plutonia microstructure. Based on the results of this study, a cyclic CO/CO_2 mechanism is proposed as the source of the CO produced.

31724 (LA—8431-PR) **General-purpose heat source project and space nuclear safety and fuels program. Progress report, March 1980.** Maraman, W.J. (comp.). (Los Alamos Scientific Lab., NM (USA)). Jul 1980. Contract W-7405-ENG-36. 55p. NTIS, PC A04/MF A01.

This formal monthly report covers the studies related to the use of $^{238}PuO_2$ in radioisotopic power systems carried out for the Advanced Nuclear Systems and Projects Division of the Los Alamos Scientific Laboratory. The two programs involved are the following: general-purpose heat source development; and space nuclear safety and fuels. Most of the studies discussed are of a continuing nature. Results and conclusions described may change as the work continues. Published reference to the results cited in this report should not be made without the explicit permission of the person in charge of the work.

31725 (PNL—1845-46) **Strontium heat source development program. Advanced Nuclear Systems and Projects Division, quarterly report, January-March 1980.** Fullam, H.T. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Apr 1980. Contract AC06-76RL01830. 15p. NTIS, PC A02/MF A01.

Sectioning of the capsules from the 30,000-h tests with $^{90}SrF_2$ has been completed at Oak Ridge National Laboratory, and examination of the test specimens is under way. Metallographic examination of specimens taken from the WESF $^{90}SrF_2$ capsule that was held at about 800°C for three years has been completed. Attack of the Hastelloy C-276 was not significantly greater than that observed in the WESF capsule held at 800°C for 5000 hours. Hydrostatic pressure testing (14,500 psi), puncture (percussion) testing, and thermal testing (800°C) of as-fabricated prototype Hastelloy S and Hastelloy C-4 outer capsules were completed. Preliminary examination of the capsules indicates that none suffered any damage as a result of the tests. Detailed examination of the capsules is under way to ensure these findings are correct.

DESIGN AND FABRICATION

31726 (LA—8296) **Comparison of finite-element stress analysis with experimental copper sphere impacts.** Frantz, C.E.; Hecker, S.S.; Stout, M.G.; Browning, R.V. (Los Alamos Scientific Lab., NM (USA)). Jul 1980. Contract W-7405-ENG-36. 22p. NTIS, PC A02/MF A01.

Three copper spheres were impacted on targets of varying surface finishes at 100 m/s. Impact face friction was varied for each test and the impact was photographed with a high-speed camera. Postimpact strains and deformation were measured. A finite-element computer code, NONSAP, was used to model the impact. The best agreement between computer prediction and experiment was obtained using isoparametric elements, a graded mesh, and actual high-strain-rate copper stress-strain data. Frictional conditions at the impact face were also modeled by altering the standard NONSAP code. The most critical test of NONSAP was accurate prediction of experimental impact strains. The best agreement we could obtain had a maximum point-to-point error of 20%, although in general, the comparison was much better. Results of this research indicate that we must know more about material and impact interface friction in order to obtain reliable numerical predictions.

HYDROGEN

31727 Hydrogen energy: a bibliography with abstracts. Quarterly update, October-December 1979. Munje, S. (ed.). Albuquerque, NM; University of New Mexico (1979). 122p.

Hydrogen energy is a continuing bibliographic summary with abstracts of research and projections on the subject of hydrogen as a secondary fuel and as an energy carrier. This quarterly update cites

332 additional references identified during the fourth quarter of 1979.

PRODUCTION

ELECTROLYSIS

REFER ALSO TO CITATION(S) 31717, 31854

THERMOCHEMICAL PROCESSES

REFER ALSO TO CITATION(S) 31854

STEAM REFORMER PROCESSES

REFER ALSO TO CITATION(S) 32024, 32025

BIOSYNTHESIS AND PHOTOCHEMICAL PROCESSES

REFER ALSO TO CITATION(S) 31853

31728 (CONF-7909152—1) **Photobiological hydrogen production.** Seibert, M.; Lien, S.; Weaver, P.F. (Solar Energy Research Inst., Golden, CO (USA)). 1979. Contract AC02-77CH00178. 20p. NTIS, PC A02/MF A01.

From 5. joint US/USSR conference of the microbial enzyme reactions project of the US/USSR joint working group on the production of substances by microbiological means; Riga, USSR (30 Sep 1979).

Hydrogen production by phototrophic organisms, which has been known since the 1930's, occurs at the expense of light energy and electron-donating substrates. Three classes of organisms, namely, photosynthetic bacteria, cyanobacteria, and algae carry out this function. The primary hydrogen-producing enzyme systems, hydrogenase and nitrogenase, will be discussed along with the manner in which they couple to light-driven electron transport. In addition, the feasibility of using in vivo and in vitro photobiological hydrogen producing systems in future solar energy conversion applications will be examined.

OTHER SYNTHETIC AND NATURAL FUELS

HYDROCARBON FUELS

REFER ALSO TO CITATION(S) 31536

PROPERTIES

REFER ALSO TO CITATION(S) 32638, 32677

31729 **Excess electron mobility in ethane. Density, temperature, and electric field effects.** Doeldissen, W. (Hahn-Meitner-Institut fuer Kernforschung Berlin GmbH, Germany); Schmidt, W.F.; Bakale, G. Contract EP-78-S-02-4746. *J. Phys. Chem.;* **84**: No. 10, 1179-1186(15 May 1980).

The excess electron mobility in liquid ethane was measured under orthobaric conditions as a function of temperature and electric field strength up to the critical temperature at 305.33 K. The low field mobility was found to rise strongly with temperature and exhibits a maximum value of 44 $cm^2 V^{-1} s^{-1}$ at 2° below the critical temperature. At temperatures above 260 K the electron drift velocity shows a sublinear field dependence at high values of the electric field strength. These observations lead to the supposition that in liquid ethane a transition from transport via localized states to transport in extended states occurs. Measurements were also performed in fluid ethane at densities from 2.4 to 12.45 mol L^{-1} and temperatures from 290 to 340 K. On isochores in the vicinity of the critical density, an increase of the low field mobility with temperature was observed. This effect was found to disappear both at low (rho = 2.4 mol L^{-1}) and high densities (rho $\geq$ 9.2 mol L^{-1}). In this density range, a sublinear field dependence of the drift velocities at high field strengths was noted. The critical velocity associated with the appearance of hot electrons was observed to decrease with higher densities indicating a smaller fractional energy transfer in electron molecule collisions. A compilation of electron mobilities in gaseous and liquid ethane shows that, up to densitiesof rho = 9.5 mol L^{-1}, μ proportional to n^{-1} is fulfilled if temperature effects are ignored. At intermediate densities, 9 mol L^{-1} < rho < 16 mol L^{-1}, a density dependence of μ proportional to rho^{-5} is found followed by a stronger mobility decrease toward the triple point. Positive ion mobilities measured under orthobaric conditions followed Walden's rule.

PREPARATION

CHEMICAL SYNTHESIS

31730 **Novel interpretations of carbon oxide reductions.** Sapienza, R.S.; Sansone, M.J.; Spaulding, L.D.; Lynch, J.F. (Brookhaven National Lab., Upton, NY). pp 179-197 of Fundamental research in homogeneous catalysis. Vol. 3. Tsutsui, M. (ed.). New York, NY; Plenum Publishing Corporation (1979).

A unified mechanism for carbon oxide reductions capable of explaining or predicting catalyst behavior is proposed. Over metal surfaces, these reactions proceed through the oxygen interaction of the carbon oxide and the formed metal-oxygen bonds determine the reaction characteristics. Over metal-oxide surface, carbon monoxide coordinates to the oxygen of the surface forming a species similar to carbon dioxide and thereby explaining the selectivity of these reactions. These simple assumptions have allowed interpretations of observations of important future processes with methanol, methane, ethanol and olefins. 3 tables. (DP)

PREPARATION FROM WASTES OR BIOMASS

REFER ALSO TO CITATION(S) 31527, 31833, 31845, 31851, 32505

ALCOHOL FUELS

REFER ALSO TO CITATION(S) 31492, 32418

31731 (CONF-790432—(Vol.1), pp 103-110) **Update in the development of alternate liquid fuels.** Rose, M.J. (Brookhaven National Lab., Upton, NY). 1979.

From Conference on industrial energy conservation technology and exhibition; Houston, TX, USA (22 Apr 1979).

Alternate Liquid Fuels (ALF) have been developed, with essentially similar characteristics as commercial ASTM fuel oils (grades No. 2, 4 and 5), at a direct cost ranging from 17 to 26.5 cents per gallon depending upon selected feedstocks and blend ratios. Since FY '77 approximately 16.6 million gallons of ALF have been produced, and consumed in the Central Steam Plant at Brookhaven. Conservatively, this represents an initial saving of over $1,253,000 thru January 1979. Extensive field and laboratory tests, conducted in late FY '76, resulted in the design of a pilot processing system utilizing standard hardware and equipment procured primarily from the Department of Defense and General Services Administration excess-equipment lists. ALF is formulated by selectively blending feedstocks of recycled or previously used semi-miscible alcohols, mineral spirits, solvents, and other combustible liquids with substandard but conventional fuel oils obtained from government surplus or purchased in the spot-market (e.g., Navy Special, Bunker C, petroleum pipeline interfaces, No. 6 residual oil from tank and barge bottoms). The inherent tendency for these feedstocks to separate from mix was resolved by improved processing system design and methodology. As a result, ALF feedstocks can now be fully integrated and lock-bonded with any of the petroleum products referenced. ALF fuels have been subjected to extended static storage and extensive firing range-thermal stability tests (-10°C to 82.2°C), and have maintained monolithic integrity. Modifications to boiler fueling systems or controls when firing approximately a 50% ALF mix, were not found necessary. Some of the advantages of ALF are listed.

PROPERTIES

REFER ALSO TO CITATION(S) 32469

CHEMICAL SYNTHESIS

REFER ALSO TO CITATION(S) 31730

PREPARATION FROM WASTES OR BIOMASS

REFER ALSO TO CITATION(S) 31830, 31834, 31840, 31841, 31842

PREPARATION

REFER ALSO TO CITATION(S) 32024, 32025

HYDRO ENERGY

HYDRO ENERGY

RESOURCES AND AVAILABILITY

REFER ALSO TO CITATION(S) 31843, 32186

31732 (AD-A—075962) **National Hydroelectric Power Resources Study. Preliminary inventory of hydropower resources. Volume 1. Pacific Northwest Region. Interim report.** Sigleo, W.R.; Hanchey, J.R.; Nolton, D.G. (Institute for Water Resources (Army), Fort Belvoir, VA (USA)). Jul 1979. 253p. NTIS, PC A12/MF A01.

The Preliminary Inventory of Hydropower Resources (PIHR) a preliminary product of the National Hydropower Study (NHS), was published in six (6) volumes (regions) to facilitate reproduction and distribution. The PIHR contains general as well as site-specific information on our nation's hydroelectric power potential. It gives estimates of existing, incremental and undeveloped hydropower potential by state and region and furthermore, breaks these categories down into size ranges of small-scale (.05-15 MW) intermediate (15-25 MW) and large-scale (greater than 25MW) sites. Because the inventory is a preliminary product of the NHS, it may be superseded at some future date. Conservative assumptions have been made in the screening and analysis process to avoid eliminating any potentially feasible sites. The current summary tables provide the best estimated to date, but to some degree, may overstate the actual capacity and energy which could be developed.

31733 (AD-A—075963) **National Hydroelectric Power Resources Study. Preliminary inventory of hydropower resources. Volume 2. Pacific Southwest Region. Interim report.** Sigleo, W.R.; Hanchey, J.R.; Nolton, D.G. (Institute for Water Resources (Army), Fort Belvoir, VA (USA)). Jul 1979. 139p. NTIS, PC A07/MF A01.

The Preliminary Inventory of Hydropower Resources (PIHR) a preliminary product of the National Hydropower Study (NHS), was published in six (6) volumes (regions) to facilitate reproduction and distribution. The PIHR contains general as well as site-specific information on our nation's hydroelectric power potential. It gives estimates of existing, incremental and undeveloped hydropower potential by state and region and furthermore, breaks these categories down into size ranges of small-scale (.05-15 MW) intermediate (15-25 MW) and large-scale (greater than 25MW) sites. Because the inventory is a preliminary product of the NHS, it may be suspended at some future date. Conservative assumptions have been made in the screening and analysis process to avoid eliminating any potentially feasible sites. The current summary tables provide the best estimated to date, but to some degree, may overstate the actual capacity and energy which could be developed.

31734 (AD-A—075964) **National Hydroelectric Power Resources Study. Preliminary inventory of hydropower resources. Volume 3. Mid-continent Region. Interim report.** Sigleo, W.R.; Hanchey, J.R.; Nolton, D.G. (Institute for Water Resources (Army), Fort Belvoir, VA (USA)). Jul 1979. 241p. NTIS, PC A11/MF A01.

The Preliminary Inventory of Hydropower Resources (PIHR) a preliminary product of the National Hydropower Study (NHS), was published in six (6) volumes (regions) to facilitate reproduction and distribution. The PIHR contains general as well as site-specific information on our nation's hydroelectric power potential. It gives estimates of existing, incremental and undeveloped hydropower potential by state and region and furthermore, breaks these categories down into size ranges of small-scale (05-15 MW) intermediate (15-25 MW) and large-scale (greater than 25 MW) sites. Because the inventory is a preliminary product of the NHS, it may be superseded at some future date. Consevative assumptions have been made in the screening and analysis process to avoid eliminating any potentially feasible sites. The current summary tables provide the best estimated to date, but to some degree, may overstate the actual capacity and energy which could be developed.

31735 (AD-A—075965) **National Hydroelectric Power Resources Study. Preliminary inventory of hydropower resources. Volume 4. Lake Central Region. Interim report.** Sigleo, W.R.; Hanchey, J.R.; Nolton, D.G. (Institute for Water Resources (Army), Fort Belvoir, VA (USA)). Jul 1979. 217p. NTIS, PC A10/MF A01.

The Preliminary Inventory of Hydropower Resources (PIHR) a preliminary product of the National Hydropower Study (NHS), was published in six (6) volumes (regions) to facilitate reproduction and distribution. The PIHR contains general as well as site-specific information on our nation's hydroelectric power potential. It gives estimates of existing, incremental and undeveloped hydropower potential by state and region and furthermore, breaks these categories down into size ranges of small-scale (.05-15 MW) intermediate (15-25 MW) and large-scale (greater than 25MW) sites. Because the inventory is a preliminary product of the NHS, it may be superseded at some future date. Conservative assumptions have been made in the screening and analysis process to avoid eliminating any potentially feasible sites. The current summary tables provide the best estimated to date, but to some degree, may overstate the actual capacity and energy which could be developed.

31736 (AD-A—075966) **National Hydroelectric Power Resources Study. Preliminary inventory of hydropower resources. Volume 5. Southeast Region. Interim report.** Sigleo, W.R.; Hanchey, J.R.; Nolton, D.G. (Institute for Water Resources (Army), Fort Belvoir, VA (USA)). Jul 1979. 197p. NTIS, PC A09/MF A01.

The Preliminary Inventory of Hydropower Resources (PIHR) a preliminary product of the National Hydropower Study (NHS), was published in six (6) volumes (regions) to facilitate reproduction and distribution. The PIHR contains general as well as site-specific information on our nation's hydroelectric power potential. It gives estimates of existing, incremental and undeveloped hydropower potential by state and region and furthermore, breaks these categories down into size ranges of small-scale (.05-15 MW) intermediate (15-25 MW) and large-scale (greater than 25MW) sites. Because the inventory is a preliminary product of the NHS, it may be superseded at some future date. Conservative assumptions have been made in the screening and analysis process to avoid eliminating any potentially feasible sites. The current summary tables provide the best estimated to date, but to some degree, may overstate the actual capacity and energy which could be developed.

31737 (AD-A—075967) **National Hydroelectric Power Resources Study. Preliminary inventory of hydropower resources. Volume 6. Northeast Region. Interim report.** Sigleo, W.R.; Hanchey, J.R.; Nolton, D.G. (Institute for Water Resources (Army), Fort Belvoir, VA (USA)). Jul 1979. 316p. NTIS, PC A14/MF A01.

The Preliminary Inventory of Hydropower Resources (PIHR) a preliminary product of the National Hydropower Study (NHS), was published in six volumes (regions) to facilitate reproduction and distribution. The PIHR contains general as well as site-specific information on our nation's hydroelectric power potential. It gives estimates of existing, incremental and undeveloped hydropower potential by state and region and furthermore, breaks these categories down into size ranges of small-scale (.05-15 MW) intermediate (15-25 MW) and large-scale (greater than 25 MW) sites. Because the inventory is a preliminary product of the NHS, it may be superseded at some future date. Conservative assumptions have been made in the screening and analysis process to avoid eliminating any potentially feasible sites. The current summary tables provide the best estimated to date, but to some degree, may overstate the actual capacity and energy which could be developed.

31738 (DOE/RA—0048) **Feasibility studies for small scale hydropower additions. A Guide Manual.** (Hydrologic Engineering Center, Davis, CA (USA); Institute for Water Resources (Army), Fort Belvoir, VA (USA)). Jul 1979. Contract AI01-77RA11025. 356p. NTIS, PC A16/MF A01.

A manual is presented that provides technical data and procedural guidance for the systematic appraisal of the viability of potential small hydropower additions. It focuses upon the concepts, technology, and economic and financial issues unique to small hydropower additions. The manual is comprised of six volumes: Technical Guide, Volume I, overviews the investigation process, provides implementation guidance, and documents case study applications; Economic and Financial Analysis, Volume II, includes criteria and procedures for marketing and valuing power output, determining economic feasibility, and analyzing financial requirements and issues critical to implementation; Hydrologic Studies, Volume III, describes investigations necessary to evaluate the hydrologic integrity of the existing facility and to estimate the power potential of the hydropower addition; Existing Facility Integrity, Volume IV, provides guidance for assessing the ability of a site to safely accommodate a power addition; Electromechanical Features, Volume V, describes selection criteria and performance characteristics of small hydro generation and ancillary equipment; and Civil Features, Volume VI, provides preliminary design and cost guidelines for the civil features of power additions. A glossary of hydropower terms follows Volume VI.

31739 (NCEI—0018) **Support services for commercialization of small hydroelectric facilities in North Carolina.** Warren, J.L. (Research Triangle Inst., Research Triangle Park, NC (USA). Applied Ecology Dept.). Jun 1980. 203p. (RTI—1671/01-02F). NTIS, PC A10/MF A01.

Small hydro is defined as those hydroelectric resources available at existing sites with a potential capacity of less than 25,000 kW, or 25 MW. There is no limitation on the height of the dam. North Carolina has between 3000 and 4000 dams. Section II reviews the assessment of the small hydro resource available in North Carolina with different data sources. Section III details the assistance given to small hydro developers in North Carolina. Section IV summarizes recommendations for future activities in support of small hydro in

North Carolina. Appendices include a list of existing and potential hydroelectric sites in North Carolina, a computerized list of power potentials at existing dams in North Carolina, a list of parties interested in small hydro, a sample letter sent to small hydro developers, and the program for a small hydro conference held in Asheville in 1979.

PLANT DESIGN AND OPERATION

REFER ALSO TO CITATION(S) 31770, 32174

REGULATIONS AND LICENSING

31740 (DOE/RA/04934—01) **Preliminary analysis of legal obstacles and incentives to the development of low-head hydroelectric power in the northeastern United States.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 81p. NTIS, PC A05/MF A01.

A preliminary analysis of the legal obstacles and incentives to the development of the low-head hydroelectric potential of the 19 northeastern US (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Ohio, Indiana, Michigan, Illinois, Wisconsin, Kentucky, Maryland, Delaware, Virginia, and West Virginia) is presented. The statutes and case laws of the 19 states and the Federal government which affect developers of small dams are stressed. The legal uncertainty which confronts the developer of small dams and the regulatory burden to which the developer may be subjected once the uncertainty is resolved are emphasized.

31741 (DOE/RA/04934—03) **Summary of the New England conference on legal and institutional incentives to small-scale hydroelectric development (Boston Massachusetts, January 30-31, 1979).** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 74p. NTIS, PC A04/MF A01.

The New England Conference on Legal and Institutional Incentives to Small Scale Hydroelectric Development examined the legal and institutional problems confronting small-scale hydroelectric potential of the northeast. Representatives from DOE, FERC, state legislatures, state public service commissions, private developers, and environmental groups attempted to evaluate the state of hydroelectric development in New England. The meeting began with an introductory panel followed by workshops addressing four topics: Federal regulatory systems, state regulatory systems, the economics of small-scale hydroelectric development, and systems dynamics and the systems dynamics model. Comments by the Honorable Georgiana H. Sheldon, FERC, are presented.

31742 (DOE/RA/04934—04) **Summary of the Mid-Atlantic conference on small-scale hydropower in the Mid-Atlantic states: resolution of the barriers impeding its development.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 100p. (CONF-7905174—(Summ.)). NTIS, PC A05/MF A01.

From Conference on small-scale hydropower in the Mid-Atlantic states; Washington, DC, USA (4 May 1979).

The workshop was conducted to bring together interested persons to examine and discuss the major problems associated with small-scale hydroelectric dam development in the Mid-Atlantic region. The conference opened with an introductory panel which outlined the objectives and the materials available to conference participants. Two of the workshops discussed problems and policy responses raised by state and Federal regulation. The other two workshops concerned economic issues confronting small-scale hydro development and the operation and usefulness of the systems dynamics model under development by the Thayer School of Engineering at Dartmouth. Various Federal and state programs designed to stimulate small-scale hydro development were discussed. A plenary session completed the workshops.

31743 (DOE/RA/04934—06) **Executive summary: legal obstacles and incentives to small-scale hydroelectric development in the six middle atlantic states.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 65p. NTIS, PC A04/MF A01.

The executive summary describes the relationship of Federal law and regulation to state law and regulation of small-scale hydroelectric facilities, highlighting important features of the constitutional, statutory, case law, and regulations of each of the six middle atlantic states (Maryland, Delaware, New York, New Jersey, Pennsylvania, and Virginia). Water law, direct and indirect regulation, and financial considerations for each state are presented. A flow diagram of regulation of small dams in each state is also included.

31744 (DOE/RA/04934—08) **Executive summary: legal obstacles and incentives to the development of small scale hydroelectric potential in the seven mid-western states.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 92p. NTIS, PC A05/MF A01.

The relationship of Federal law and regulation to state law and regulation of small-scale hydroelectric facilities is described. Important features of the constitutional law, statutory law, case law, and regulations of each of the 7 mid-western states (Illinois, Indiana, Kentucky, Michigan, Ohio, West Virginia, and Wisconsin) are highlighted. The introductory section examines the dual regulatory system from the standpoint of the appropriate legal doctrine, i.e., the law of pre-emption, and the application of this law to the case of hydroelectric development and regulation of water resources. A state-by-state synopsis of these important provisions of the laws of the states that have a bearing on small-scale hydroelectric development is presented.

31745 (DOE/RA/04934—09) **Legal obstacles and incentives to the development of small scale hydroelectric potential in Illinois.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 83p. NTIS, PC A05/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric energy at the state level are described. The Federal government also exercises extensive regulatory authority in the area. The introductory section examines the dual regulatory system from the standpoint of the appropriate legal doctrine, the law of pre-emption, application of the law to the case of the hydroelectric development, and concludes with an inquiry into the practical use of the doctrine by the FERC. The first obstacle which every developer in Illinois must confront is obtaining authority to utilize the river bed, banks, and flowing water at the proposed site. This involves determination of ownership of the stream banks and bed and the manner of obtaining either their title or use; and existing constraints with regard to the use of the water. Illinois follows the riparian theory of water law. Following the detailed discussion of the water law, direct and indirect regulations and financial considerations are discussed.

31746 (DOE/RA/04934—10) **Legal obstacles and incentives to the development of small scale hydroelectric power in Kentucky.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 113p. NTIS, PC A06/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric energy at the state level are examined. The introductory section examines the dual regulatory system from the standpoint of the appropriate legal doctrine, the law of pre-emption, application of the law to the case of hydroelectric development, and concludes with an inquiry into the practical use of the doctrine by the FERC. Additional sections cover acquisition; liability; Department for Natural Resources and Environmental Protection; energy utilities; local regulations; incidental impacts; financial considerations; and sources of information. In Kentucky, many of the impacts have not been implemented with regard to small-scale hydroelectric energy, since in Kentucky most electricity is coal-generated and any hydroelectric power that does exist, is derived from TVA or the Army Corp of Engineer projects.

31747 (DOE/RA/04934—11) **Legal obstacles and incentives to the development of small-scale hydroelectric power in Rhode Island.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 52p. NTIS, PC A04/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric energy at the state level are discussed. The Federal government also exercises extensive regulatory authority in the area, and the dual regulatory system from the standpoint of the appropriate legal doctrine, the law of pre-emption, application of the law to the case of hydroelectric development, and an inquiry into the practical use of the doctrine by the FERC is examined. In Rhode Island, any private rights in the flowing waters of a river or stream depend upon ownership of the abutting land. It appears Rhode Island follows the reasonable use theory of riparian law. The Department of Environmental Management is the most significant administrative agency with regard to dam construction, alteration, and operation in the state of Rhode Island.

31748 (DOE/RA/04934—12) **Legal obstacles and incentives to the development of small scale hydroelectric power in New Hampshire.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 49p. NTIS, PC A03/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric energy at the state level are described. The Federal government also exercises extensive regulatory authority in the area and the dual regulatory system from the standpoint of the appropriate legal doctrine, the law of pre-emption, application of the law to the case of hydroelectric development, and an inquiry into the practical use of the doctrine by the FERC is examined. The first

step any developer must take is that of acquiring the real estate parcel. The step involves acquisition in some manner of both river banks, the river bed, and where necessary the land needed for the upstream impoundment area. The developer must acquire the river banks to be considered a riparian owner. Classification as a riparian is important for only a use of water by a riparian owner is deemed a reasonable use and hence legal. Apart from acquisition by sale, lease, or gift, New Hampshire law permits a number of other methods. In part use of these methods will depend on whether the developer is the state, a municipality, a private corporation, or a public utility. Provided the developer avails himself of the five (5) megawatts exemption, his main regulatory agency will be the Water Resources Board. However, the state is not free from the problems of legal uncertainty inherent in determinations of reasonableness.

31749 (DOE/RA/04934—13) **Legal obstacles and incentives to the development of small scale hydroelectric power in Delaware.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 110p. NTIS, PC A06/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric energy at the state level are discussed. The Federal government also exercises extensive regulatory authority in the area, and the dual regulatory system from the standpoint of the appropriate legal doctrine, the law of pre-emption, application of the law to the case of hydroelectric development, and an inquiry into the practical use of the doctrine by the FERC is examined. In Delaware, a watercourse is not to be confused with surface water. Each gives rise to certain riparian rights, but the law makes certain distinctions between the two. The presence of both surface waters and watercourses give rise to private and public rights related to the presence of the water. Some of these rights are vested in riparian owners. Recent Delaware case law has described the riparian owner as one who owns land on the bank of a river, or who is owner of land along, bordering upon, bounded by, fronting upon, abutting, or adjacent and contiguous to and in contact with a river. But, ownership of the bank does not give the riparian ownership of the water. Some law cases are cited to discuss the laws in Delaware.

31750 (DOE/RA/04934—14) **Legal obstacles and incentives to the development of small scale hydroelectric power in New York.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 127p. NTIS, PC A07/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric energy at the state level are discussed. The Federal government also exercises extensive regulatory authority in the area, and the dual regulatory system from the standpoint of the appropriate legal doctrine, the law of pre-emption, application of the law to the case of hydroelectric development, and an inquiry into the practical use of the doctrine by the FERC is examined. The first step the small scale hydroelectric developer must take is that of acquiring title to the real property comprising the development site. The real estate parcel must include the requisite interest in the land adjacent to the watercourse, access to the underlying streambed and where needed, the land necessary for an upstream impoundment area. Land acquisition may be effectuated by purchase, lease, or grant by the state. In addition to these methods, New York permits the use of the eminent domain power of the state for public utilities under certain circumstances.

31751 (DOE/RA/04934—16) **Legal obstacles and incentives to the development of small scale hydroelectric power in New Jersey.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 75p. NTIS, PC A04/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric energy at the state level in New Jersey are described. The Federal government also exercises extensive regulatory authority in the area. The dual regulatory system from the standpoint of the appropriate legal doctrine, the law of pre-emption, application of the law to the case of hydroelectric development, and an inquiry into the practical use of the doctrine by the FERC is discussed. New Jersey follows the riparian theory of water law. Following an extensive discussion of the New Jersey water law, New Jersey regulatory law and financial considerations regarding hydroelectric power development are discussed.

31752 (DOE/RA/04934—17) **Legal obstacles and incentives to the development of small scale hydroelectric power in Pennsylvania.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 71p. NTIS, PC A04/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric energy at the state level are discussed. The Federal government also exercises extensive regulatory authority in the area, and the dual regulatory system from the standpoint of the appropriate legal doctrine, the law of pre-emption, application of the law to the case of hydroelectric development, and an inquiry into the practical use of the doctrine by the FERC is examined. In Pennsylvania, there are 3 methods by which rights in water may be acquired: riparian ownership, prescription, and condemnation. These are discussed.

31753 (DOE/RA/04934—18) **Legal obstacles and incentives to the development of small scale hydroelectric power in Maryland.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 70p. NTIS, PC A04/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric energy at the state level in Maryland are described. The Federal government also exercises extensive regulatory authority in the area. The dual regulatory system is examined with the aim of creating a more orderly understanding of the vagaries of the system, focusing on the appropriate legal doctrine, the law of pre-emption, application of the law to the case of hydroelectric development, and an inquiry into the practical use of the doctrine by the FERC. In Maryland, by common law rule, title to all navigable waters and to the soil below the high-water mark of those waters is vested in the state as successor to the Lord Proprietary who had received it by grant from the Crown. Rights to non-navigable water, public trust doctrine, and eminent domain are also discussed. Direct and indirect regulations, continuing obligations, loan programs, and regional organizations are described in additional sections.

31754 (DOE/RA/04934—19) **Legal obstacles and incentives to the development of small scale hydroelectric potential in Wisconsin.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 82p. NTIS, PC A05/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric energy at the state level are discussed. The Federal government also exercises extensive regulatory in the area, and the dual regulatory system from the standpoint of the appropriate legal doctrine, the law of pre-emption, application of the law to the case of hydroelectric development, and an inquiry into the practical use of the doctrine by the FERC is examined. The initial obstacle that all developers confront in Wisconsin is obtaining the authority to utilize the bed, banks, and flowing water at a proposed dam site. This involves a determination of ownership of the stream banks and bed and the manner of obtaining either their title or use; and existing constraints with regard to the use of the water. Wisconsin follows the riparian theory of water law.

31755 (DOE/RA/04934—20) **Analysis of legal obstacles and incentives to the development of low-head hydroelectric power in Maine.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 71p. NTIS, PC A04/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric energy at the state level in Maine is discussed. The Federal government also exercises extensive regulatory authority in the area. The dual regulatory system is examined. The first step any developer of small-scale hydropower must take is to acquire right, title, or interest in the real property. In Maine, that step requires acquisition in some form of both river banks, the river bed, and where necessary, the land needed for the upstream impoundment area. The developer must acquire the river banks to be considered a riparian owner. Classification as a riparian is important, for only a use of water by a riparian owner is deemed a reasonable use and hence a legal use. A non-riparian could not draw water from a stream to increase the water level of an impoundment area on another stream. Apart from the usual methods of land acquisition involving sale, lease, or perhaps gift, Maine has two somewhat unique methods a developer may use for property acquisition. These methods, authorized by statute, are use of the abandoned dams law and use of the Mill Dam Act for flowage of upstream impoundment areas.

31756 (DOE/RA/04934—21) **Legal obstacles and incentives to the development of small scale hydroelectric power in Vermont.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 47p. NTIS, PC A03/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric energy at the state level in Vermont are discussed. The dual regulatory system involving state and Federal governments is discussed followed by discussions on property interests; direct regulation by the Public Service Board; indirect regulation; and financial considerations. An initial step required of any developer is that of real property acquisition. Ordinarily this involves acquiring the stream bed, land along the stream banks, and land needed for the impoundment reservoir. Ownership of land along the stream banks places the developer in the position of a riparian owner. This status is important in that only riparian owners are entitled to a reasonable use of the flowing water. In addition to acquisition by sale, lease, or gift, Vermont law allows certain devel-

opers to acquire property via eminent domain. Some general rules which have evolved as riparian law and applied in Vermont are discussed.

31757 (DOE/RA/04934—22) **Legal obstacles and incentives to the development of small scale hydroelectric power in West Virginia.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 128p. NTIS, PC A07/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric in West Virginia at the state level are described. The Federal government also exercises extensive regulatory authority in the area. The introductory section examines the dual regulatory system from the standpoint of the appropriate legal doctrine, the law of pre-emption, application of the law to the case of hydroelectric development, and concludes with an inquiry into the practical use of the doctrine by FERC. The development of small-scale hydroelectric energy depends on the selection of a site which will produce sufficient water power capacity to make the project economically attractive to a developer. In West Virginia, the right to use the flowing waters of a stream, creek, or river is appurtenant to the ownership of the lands bordering the watercourse. The lands are known as riparian lands. The water rights are known as riparian rights. Thus, the first obstacle a developer faces involves the acquisition of riparian lands and the subsequent right to the use of the water. The water law in West Virginia is discussed in detail followed by discussions on direct and indirect regulations; continuing obligations; financial considerations; and interstate organizations.

31758 (DOE/RA/04934—23) **Legal obstacles and incentives to the development of small scale hydroelectric power in Connecticut.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 67p. NTIS, PC A04/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric power in Connecticut are discussed. The Federal government also exercises extensive regulatory authority in the area and this dual system is examined from the standpoint of the appropriate legal doctrine, the law of pre-emption, application of the law to the case of hydroelectric development, and an inquiry into the practical use of the doctrine by the FERC. Connecticut follows the riparian theory of water law. Under this theory of the water law, private rights in rivers and streams are confined to the use of flowing water. A riparian proprietor does not own the water that flows by his estate. Licensing, permitting, and review procedures are discussed followed by discussion on public utilities regulation and indirect considerations.

31759 (DOE/RA/04934—24) **Legal obstacles and incentives to the development of small scale hydroelectric projects in Massachusetts.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 83p. NTIS, PC A05/MF A01.

The legal and institutional obstacles to the development of small scale hydroelectric energy at the state level are discussed. The discussion is designed to aid the developer in the determination of which permits, licenses, and laws of the state must be secured or complied with for the development of a project. The Federal government also exercises extensive regulatory authority in the area. The introductory section examines the dual regulatory system from the standpoint of the appropriate legal doctrine, the law of pre-emption, application of the law to the case of hydroelectric development, and concludes with an inquiry into the practical use of the doctrine by the FERC. Specific sections that follow are: Massachusetts Water Law; Licensing, Permitting, and Review Procedures; Indirect Considerations (by departments); Department of Public Utilities Regulation of Privately Owned Electric Utilities; Massachusetts Municipal Wholesale Electric Company; Miscellaneous Legal Issues Relating to Low-Head Hydroelectric Power; and Financial Considerations.

31760 (DOE/RA/04934—25) **Legal obstacles and incentives to the development of small scale hydroelectric potential in Michigan.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 67p. NTIS, PC A04/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric energy at the state level is described. The Federal government also exercises extensive regulatory authority in the area. The first obstacle which any developer must confront in Michigan is obtaining the authority to utilize the river bed, banks, and flowing water at a proposed dam site. This involves a determination of ownership of the stream banks and bed, and the manner of obtaining either their title or use; and existing constraints with regard to the use of the water. Michigan follows the riparian theory of water law. The direct regulation; indirect regulation; public utilities regulation; financing; and taxation are discussed.

31761 (DOE/RA/04934—26) **Legal obstacles and incentives to the development of small scale hydroelectric power in Ohio.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 87p. NTIS, PC A05/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric energy at the state level is described. The Federal government also exercises extensive regulatory authority in the area. The introductory section examines the regulatory system from the standpoint of the appropriate legal doctrine, the law of pre-emption, application of the law to the case of hydroelectric development, and concludes with an inquiry into the practical use of the doctrine by the FERC. A developer must obtain title or interest to a streambed from the proper riparian owners. Ohio provides assistance to an electric company in this undertaking by providing it with the power of eminent domain in the event it is unable to reach a purchase agreement with the riparian proprietors. The Ohio Water Law is discussed in detail, followed by discussions: Licensing, Permitting, and Review Procedures; Indirect Considerations; Ohio Public Utilities Commission; Ohio Department of Energy; Incidental Provision; and Financial Considerations.

31762 (DOE/RA/04934—27) **Legal obstacles and incentives to the development of small scale hydroelectric power in Indiana.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 68p. NTIS, PC A04/MF A01.

The legal and institutional obstacles to the development of small-scale hydroelectric energy in Indiana are examined. The Federal government also exercises extensive regulatory authority in the area. An examination is made of the Federal-state relationships with the aim of creating a more orderly understanding of the vagaries of the system. The introductory chapter examines the dual regulatory system from the standpoint of the appropriate legal doctrine, the law of pre-emption, application of the law to the case of hydroelectric development, and concludes with an inquiry into the practical use of the doctrine by the FERC. The Indiana water law; direct and indirect regulations; the Public Service Commission of Indiana; and financial considerations are examined.

31763 (DOE/RA/04934—32) **Case study analysis of legal and institutional obstacles and incentives to the development of the hydroelectric potential at Goose River, Maine.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 89p. NTIS, PC A05/MF A01.

The case study is an analysis of the legal, institutional, and financial incentives and obstacles to the development of the hydroelectric potential on the Goose River in Maine. The Goose River project concerns development by a private developer, Maine Hydro-Electric Development Corporation. The project is comprised of a five-dam system, with the first dam located at Swan Lake and the fifth dam about one mile from the sea. It will utilize the 7500 acre-feet of storage capacity of Swan Lake to run the four downstream power stations. The system is designed to generate 430 kWs of total capacity which would be sold to Central Maine Power, the local investor-owned public utility.

31764 (DOE/RA/04934—33) **Case study analysis of the legal and institutional obstacles and incentives to the development of the hydroelectric power of the Boardman River at Traverse City, Michigan.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 152p. NTIS, PC A08/MF A01.

An analytic description of one decision-making process concerning whether or not to develop the hydroelectric potential of the Boardman River is presented. The focus of the analysis is on the factor that the developers considered, or should consider in making a responsible commitment to small-scale hydroelectric development. Development of the Boardman River would occur at the five dam sites. Two existing dams, owned by the county, previously generated hydroelectricity, as did a third before being washed out. One dam has never been utilized. It is owned by the city which also owns the washed-out area. The study concludes that hydroelectric power is feasible at each. Grand Traverse County and Traverse City would engage in a joint venture in developing the resource. Chapter I presents a detailed description of the developers, the river resource, and the contemplated development. Chapter II is an analysis of the factors affecting the decision making process. Chapter III summarizes the impact of the more significant barriers and incentives and presents recommendations that, if implemented, will favorably affect decisions to develop small-scale hydroelectric generation capability.

31765 (DOE/RA/04934—34) **Case study analysis of legal and institutional obstacles and incentives to the potential hydroelectric development at High Falls State Park, Georgia.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 62p. NTIS, PC A04/MF A01.

The decision processes, legal constraints, and institutional factors involved in the development of hydroelectric plant at High Falls State Park, Georgia, are studied. Those factors which promote

or discourage the development of a site are clarified. The four sites under discussion are located on the Towaliga River in the Park in Monroe County, about 50 miles south of Atlanta. The feasibility study notes that the site under consideration (the dam) is technically, environmentally, and economically feasible, but that the old powerhouse site, which was not studied because its 110 feet head exceeded the limits under the DOE Program Research and Development Announcement grant offered greater economic benefits without adding additional environmental costs. At present, the Department of Natural Resources decision involves the consideration of the historic, recreational, and environmental values, the authority to develop and sell, the budgetary appropriation, the market for the energy, the licensing of the project, and the political implications of such development. These variables are assessed with the development of the project in view.

31766 (DOE/RA/04934—35) **Case study analysis of legal and institutional obstacles and incentives to the development of the Cornell hydro project at Cornell, Wisconsin.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 85p. NTIS, PC A05/MF A01.

The Cornell hydroelectric facility and flowage is located in Chippewa County, Wisconsin, with the power plant located in the city of Cornell, Wisconsin, on the Chippewa River. Northern States Power Company of Wisconsin is the owner of the Cornell project as well as the owner and operator of the dam, flowage, and power plant six miles upstream at Holcombe, Wisconsin. The project has been generating electricity at the rate of 100 million kW per year since commercial operation began in August of 1976. This operation results in the annual saving of nearly 3 million dollars over the cost of alternative oil-fired energy production.

31767 (DOE/RA/04934—36) **Case study analysis of the legal and institutional obstacles and incentives to the development of the hydroelectric power at the Maxwell locks and dam, Pennsylvania.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 71p. NTIS, PC A04/MF A01.

The legal, institutional and financial obstacles, and incentives to the development of hydroelectric power at the Maxwell locks and dam on the Monongahela River are analyzed. The study is one of five studies prepared by the Energy Law Institute pursuant to a contract with the National Conference of State Legislators. Each of the five studies views dam development by a different category of developer. These categories include a municipality, a public utility, a state, a private developer, and a cooperative. The Maxwell case study concerns potential development by Allegheny Electric Cooperative. Thus, the analysis of obstacles and incentives is focused on those factors which have particular impact on a cooperative. Subjects covered include a description of the site; developer description; the feasibility study; the economic feasibility; financing; Federal licensing by FERC; state licensing; local interest and requirements; the effect of locks and dam operation by the Army Corp of Engineers; and power marketing.

ECONOMICS AND MANAGEMENT

31768 (DOE/EIA—0171(78)) **Hydroelectric plant construction cost and annual production expenses, 1978. Twenty-second annual supplement.** (Department of Energy, Washington, DC (USA). Energy Information Administration). Nov 1979. 174p. NTIS, PC A08/MF A01.

At the end of 1978 there were 1146 hydroelectric plants owned and operated by electric utilities, including Federal and state agencies in the United States. Detailed data are presented for 1978 on plant investment, annual production expenses, and related information for 476 selected major hydroelectric plants. Of these, 470 are in the contiguous United States, 3 in Alaska, and 3 in Puerto Rico. Data for plants with an installed capacity of 10 MW or less are not reported in sufficient detail for inclusion in this publication. The 476 hydroelectric plants reported account for 98% of the total installed capacity and nearly 100% of the total net generation for all hydroelectric plants in the US. Of the reported plants, 343 are non-Federal plants. Three of the plants included in this publication began commercial operation in 1978 and are newly reported. Thirty-five plants, which were not included in previous supplements, have been included in this publication. No hydroelectric plant retirements were reported in 1978.

31769 (DOE/RA/04934—02) **Fundamental economic issues in the development of small scale hydro.** (Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center). May 1980. Contract AS02-78RA04934. 28p. NTIS, PC A03/MF A01.

Some basic economic issues involved in the development of small-scale hydroelectric power are addressed. The discussion represents an economist's view of the investment process in this resource. Very little investment has been made in small-scale hydro development and an attempt is made to show that the reason for this may not be that the expected present worth of the returns of the project do not exceed the construction cost by a sufficient amount. Rather, a set of factors in combination impose costs on the project not normally incurred in small businesses. The discussion covers costs, supply, demand, and profitability.

ENVIRONMENTAL ASPECTS

REFER ALSO TO CITATION(S) 32820

31770 (ORNL/TM—7396) **Analysis of environmental issues related to small scale hydroelectric development. II. Design considerations for passing fish upstream around dams. Environmental Sciences Division Publication No. 1567.** Hildebrand, S.G. (ed.). (Oak Ridge National Lab., TN (USA)). Aug 1980. Contract W-7405-ENG-26. 87p. NTIS, PC A05/MF A01.

The possible requirement of facilities to move migrating fish upstream around dams may be a factor in determining the feasibility of retrofitting small dams for hydroelectric generation. Basic design considerations are reported that should be evaluated on a site-specific basis if upstream fish passage facilities are being considered for a small scale hydroelectric project (defined as an existing dam that can be retrofitted to generate 25 MW or less). Information on general life history and geographic distribution of fish species that may require passage is presented. Biological factors important in the design of upstream passage facilities are discussed: gas bubble disease, fish swimming speed, oxygen consumption by fish, and diel and photo behavior. Three general types of facilities (fishways, fish locks, and fish lifts) appropriate for upstream fish passage at small scale hydroelectric projects are described, and size dimensions are presented. General design criteria for these facilities (including fish swimming ability and behavior) and general location of facilities at a site are discussed. Basic cost considerations for each type of passage facility, including unit cost, operation and maintenance costs, and costs for supplying attraction water, are indicated.

SOLAR ENERGY

31771 (NP—24451) **Indian solar energy resources index, 1975-1979.** (Tata Energy Research Inst., Bombay (India)). May 1980. 86p. NTIS (US Sales Only), PC A05/MF A01.

A bibliography of 746 references on major Indian solar energy resource papers is presented. The references are categorized to the various solar energy disciplines. An author index is included. (WHK)

31772 **Solar energy technology handbook. Part A. Engineering fundamentals.** Dickinson, W.C.; Cheremisinoff, P.N. (eds.). New York, NY; Marcel Dekker, Inc. (1980). 882p.

The handbook is intended as a reference work that covers the field of solar engineering as well as peripherally related fields. Part A is divided into six main units: (1) The Solar Resource; (2) Solar Thermal Collectors; (3) Photovoltaics; (4) Bioconversion; (5) Wind Energy; and (6) Solar Energy Storage Systems. Individual topics under each unit are abstracted separately. (LS)

31773 **Solar energy and the biosphere.** Halacy, D.S. Jr. (Solar Energy Research Inst., Golden, CO). pp 3-13 of Solar energy technology handbook. Part A. Engineering fundamentals. Dickinson, W.C.; Cheremisinoff, P.N. (eds.). New York, NY; Marcel Dekker, Inc. (1980).

The interaction of the sun with the earth's biosphere is discussed. The relation of solar radiation to photobiological processes is considered. Specific processes described include the energetics of photochemistry, vision, phototropism and photosynthesis. The various forms in which energy appears and is stored in the biosphere are reviewed, including solar, ocean thermal, wind, hydropower, fossil fuels, internal heat in the earth, tidal power, nuclear and fusion energy. (SPA)

31774 **California solar business directory.** Yudelson, J.; Kitchin, M. Sacramento, CA; Solar Business Office (1980). 194p. (NP—24991). $10.00.

This directory lists over 1200 firms and individuals in California with an express commercial interest in solar energy. The businesses are listed alphabetically and also by specialty. California state solar programs are described. Other sections discuss business interest groups, consumer guidelines for buying solar, government loans for solar businesses, solar legislation 1979-80, and solar housing developments. (WHK)

RESOURCES AND AVAILABILITY

REFER ALSO TO CITATION(S) 31998

31775 (DOE/ET/20090—6) **Alternative Solar Indices.** Lantz, L.J. (Solar Environmental Engineering Co., Inc., Fort Collins, CO (USA)). 1 Jul 1980. Contract AC02-77ET20090. 15p. NTIS, PC A02/MF A01.

Possible alternative Solar Indices which could either be a perturbation from the currently defined Solar Index or possible indices based on current technologies for other media markets are discussed. An overview is given of the current project, including the logic that was utilized in defining its current structure and then alternative indices and definitions are presented and finally, recommendations are made for adopting alternative indices.

31776 (DOE/ET/20090—7) **Solar Index prediction methodology for early delivery.** Lantz, L.J. (Solar Environmental Engineering Co., Inc., Fort Collins, CO (USA)). 1980. Contract AC02-77ET20090. 13p. NTIS, PC A02/MF A01.

Since the beginning of the Solar Index project in 1978, it has been one of the primary objectives to deliver the Indices in mid-afternoon local standard time. This was desirable because it would make it possible to have the numbers broadcast in the early evening news. A short description of the current project is presented and then a summary of the work that led to the early delivery of the Solar Index is given.

31777 (DOE/ET/20090—8) **Solar Index generation and delivery.** Lantz, L.J. (Solar Environmental Engineering Co., Inc., Fort Collins, CO (USA)). 1980. Contract AC02-77ET20090. 19p. NTIS, PC A02/MF A01.

The Solar Index, more completely defined as the Service Hot Water Solar Index, was conceptualized during the spring of 1978 with direction from a US Government interoffice agency committee which was headed by the Department of Energy. The purpose was to enhance public awareness of solar energy usability. Basically, the Solar Index represents the percentage of energy that solar would provide in order to heat an 80-gallon service hot water load for a given location and day. The Index is computed by utilizing SOLCOST, a computer program, which in addition to solar service hot water systems, has the ability to estimate thermal performance of space heating, cooling, and heat pump systems. It also supplies economic analyses for these solar energy systems. The Index is generated daily for most large metropolitan locations in the country. The definition of the Index, how the project came to be, what it is at the present time, and a plan for the future are presented. Also presented are the models used for the generation of the Index, a discussion of the primary tool of implementation (the SOLCOST Program), and future efforts.

31778 (ORAU/IEA—80-10(M)) **Stochastic sun: understanding the intermittent resource.** Boyd, D.A. (Oak Ridge Associated Universities, Inc., TN (USA). Inst. for Energy Analysis). Jun 1980. Contract AC05-76OR00033. p. NTIS, PC A04/MF A01.

The concept of the ideal system is introduced as a device for separating resource limits from system effects. The limitations on ideal system performance arising from intermittency are examined and the relationship between real systems and ideal systems are discussed. The general nature of the results of such an approach and of their implications for solar utilization are illustrated. (MHR)

31779 (SOLAR/0010—80/06) **Environmental data for sites in the National Solar Data Network.** (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). Jun 1980. Contract AC01-79CS30027. 271p. NTIS, PC A10/MF A01.

Available meteorological data are tabulated for reporting sites in the National Solar Data Network as follows: insolation, temperature, wind, and relative humidity. (MHR)

31780 (SOLAR/0010—80/07) **Environmental data for sites in the national solar data nctwork.** (Automation Industries, Inc., Silver Spring, MD (USA). Vitro Labs. Div.). Jul 1980. Contract AC01-79CS30027. 265p. NTIS, PC A12/MF A01.

The Department of Energy's National Solar Data Program established solar energy systems in residential and commercial buildings across the United States. These solar sites are linked to Vitro Laboratories Division's computer in the National Solar Data Network (NSDN). Vitro collects and analyzes data from this network to determine the thermal performance of each of the solar systems. The network consists of: (1) sensors which measure key performance parameters at a selected site; (2) a Site Data Acquisition Subsystem (SDAS); (3) telephone transmission circuits; and (4) a Central Data Processing System (CDPS). For the majority of parameters, raw data is collected approximately every five minutes. Solar insolation and certain other parameters, which are subject to rapid variance, are sampled every 32 seconds. Environmental information collected at the sites for the reporting month are presented. The environmental data for the NSDN are presented in the form of tables for each solar site. The solar sites are grouped into 12 zones, each of which consists of several adjacent states (as shown in Figure 1). The solar energy sites are in alphabetical sequence within each zone. The tables provide available meteorological data for reporting sites in the NSDN as follows: (1) the insolation table presents the total, diffuse, direct, maximum, and extra-terrestrial radiation for the solar site. It also shows the ratio of total extra-terrestrial radiation, as a percent. (2) The temperature table gives the average, daytime, nighttime, maximum, minimum and inlet-water temperatures for the solar site. Additional tables are presented for some of the sites, supplying either wind or relative humidity data or both. (WHK)

31781 **Solar geometry and time.** Bush, G.E.; Richards, L.M. (Lawrence Livermore Lab., CA). pp 39-64 of Solar energy technology handbook. Part A. Engineering fundamentals. Dickinson, W.C.; Cheremisinoff, P.N. (eds.). New York, NY; Marcel Dekker, Inc. (1980).

The geometric aspects that influence the solar energy incident on a collecting surface are considered. These include the effects of latitude and longitude, and the effects of the earth's orbit around the sun and its rotation. The equations for solar geometry and time are presented and applied to determine the orientation of tracking collectors which optimizes the incident solar energy. (SPH)

31782 **New U.S. network for solar radiation measurements.** Lufkin, D.H. (National Oceanic and Atmospheric Administration, Rockville, MA). pp 167-172 of Solar energy technology handbook. Part A. Engineering fundamentals. Dickinson, W.C.; Cheremisinoff, P.N. (eds.). New York, NY; Marcel Dekker, Inc. (1980).

The history of solar radiation measurements in the United States is reviewed. A program for rehabilitation of the observation network and the previous data is discussed. (SPH)

31783 **Instrumentation for solar radiation measurements.** Anson, D. (Lawrence Berkeley Lab., CA). pp 173-197 of Solar energy technology handbook. Part A. Engineering fundamentals. Dickinson, W.C.; Cheremisinoff, P.N. (eds.). New York, NY; Marcel Dekker, Inc. (1980).

A survey of solar radiation measuring instruments and a description of common types are presented. Sources of measurement errors, arising from instrumental, operational and environmental causes, are considered. (SPH)

31784 **Infrared radiation measurements.** Anson, D. (Lawrence Berkeley Lab., CA). pp 199-213 of Solar energy technology handbook. Part A. Engineering fundamentals. Dickinson, W.C.; Cheremisinoff, P.N. (eds.). New York, NY; Marcel Dekker, Inc. (1980).

Thermal and photon detectors of infrared radiation are considered. The characteristics of infrared radiometers are discussed. Approaches to eliminate undesirable signals from conductive and convective gains are described, including ventilating and shielding of the detector. Applications of infrared measurements are discussed. (SPH)

ECONOMICS

REFER ALSO TO CITATION(S) 31999, 32000

31785 (SERI/TP—733-698) **Implementing state solar financial incentives and RD and D programs.** Roessner, J.D. (Solar Energy Research Inst., Golden, CO (USA)). May 1980. Contract AC02-77CH00178. 23p. (CONF-800635—2). NTIS, PC A02/MF A01.

From Conference of the American Society of Heating, Refrigeration and Air Conditioning Engineers; Denver, CO, USA (22 Jun 1980).

The following subjects are discussed: changing federal-state relationships in energy, state and federal policy concerns in solar and renewable energy, the framework of research on the policy implementation process, description of state solar financial incentive programs, effects of state background conditions on implementation of financial incentive programs, the effect of organizational and administrative factors on implementation of state solar financial programs, description of RD and D programs in selected states, background characteristics and the implementation of RD and D programs, and the effect of organizational and administrative factors on implementation of state solar RD and D programs. (MHR)

31786 **Construction costs in commercial solar.** King, T.A.; Carlock, J.B. III. *Build. Syst. Des.;* 77: No. 1, 11-31(Dec 1979).

This paper summarizes the cost data collected to date, compares the costs of different systems, and presents an analysis of factors that may have an impact on solar system and subsystem construction costs. The cost factors discussed include the following: system type, new versus retrofit systems, economics of scale, collector mounting, multi-function support structures, storage type and size, and control complexity.

ENVIRONMENTAL, LEGAL, AND INSTITUTIONAL ASPECTS

REFER ALSO TO CITATION(S) 31788, 32820

31787 (P—500-78-039) **Regulations for the California Solar Energy Tax Credit.** (California Energy Commission, Sacramento (USA)). Apr 1978. 20p. California Energy Commission, Sacramento.

These regulations apply to solar systems installed before January 1, 1980.

Guidelines and criteria for the California Solar Tax Credit Law are presented. (WHK)

SOLAR ENERGY CONVERSION

PHOTOVOLTAIC CONVERSION

REFER ALSO TO CITATION(S) 31843, 32460, 32568, 32571, 32572, 32573

31788 (DHEW(NIOSH)—80-112) **Industrial hygiene characterization of the photovoltaic solar cell industry.** Briggs, T.M.; Owens, T.W. (National Inst. for Occupational Safety and Health, Cincinnati, OH (USA). Div. of Surveillance, Hazard Evaluation and Field Studies). Mar 1980. 342p. NIOSH, Cincinnati, OH.

The potential occupational health and safety hazards of photovoltaic devices are evaluated. The information presented is based on a comprehensive literature review and walk-through surveys of 14 production or research and development facilities. The investigation covers the technology from base material preparation through final module assembly. Descriptions are given of major technologies under development and the associated chemical and physical agents to which workers could be exposed. In-depth sampling surveys were conducted. Industrial hygiene concerns connected with each major technology are presented. Available health effects literature is listed for the chemicals used in all reviewed technoiogies. The investigation revealed that of the facilities surveyed, the industry presently appears to be generally well controlled, especially as to the single crystal silicon technology which is the most highly developed technology in the industry. Comprehensive industrial hygiene sampling was performed in a few facilities regarded as representing the norm. With the exception of elevated exposures to silver during grid metalization in one facility and to arsenic during gallium arsenide wafer production in another facility, all other exposures monitored were well within the standards. It must be realized, however, that toxic compounds are used and continued surveillance within the industry during its growth should be maintained.

31789 (DOE/ET/20279—97) **Design of solar cells for use in photovoltaic/thermal collectors.** Cox, C.H. III. (Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.). 1980. Contract AC02-76-ET20279. 7p. (CONF-801102—19). NTIS, PC A02/MF A01.

From ASME winter annual meeting; Chicago, IL, USA (16 Nov 1980).

A promising design development for combined photovoltaic/thermal (PV/T) collectors is one in which the photovoltaic cell is both the conversion device for electrical energy and the absorber of thermal energy. To accomplish this, the PV cell design is modified to use the approximately 25 percent of the air mass 1 spectrum at lambda $>$ 1.1 μm that is currently rejected by the cell. The parameters investigated are: cell back metallization, back surface field, texture etching and anti-reflective coating. A model indicating the increase in absorptance as a function of these parameters is presented, together with the results of experimental measurements. Discussion closes with the presentation of a PV/T collector design that incorporates the improved cells, has 10 percent greater thermal output than current PV/T collectors, and exhibits no degradation in electrical output.

31790 (DOE/ET/23004—T1) **Thin films of InP for photovoltaic energy conversion. First quarterly technical progress report, July 5, 1979-September 28, 1979.** Manasevit, H.M.; Ruth, R.P.; Moudy, L.A.; Yang, J.J.J.; Johnson, R.E. (Rockwell International Corp., Anaheim, CA (USA). Electronic Devices Div.). Nov 1979. Contract AC02-79ET23004. 35p. NTIS, PC A03/MF A01.

A research study is in progress to develop a low-cost high-efficiency thin-film InP heterojunction solar cell, using the metalorganic chemical vapor deposition (MO-CVD) technique for InP film growth on suitable low-cost substrates. Heterostructure devices of CdS/InP and indium tin oxides (ITO)/InP are to be prepared by Stanford University under subcontract, using the InP films grown by MO-CVD. The first quarter's work is summarized. An existing reactor system was modified and upgraded, with provision for growth of GaAs intermediate layers and p-type doping capability using a premixed metalorganic Zn compound source, as well as a dilution system common to the dopants and the Group III and Group V reactants. The all-fused-quartz deposition chamber was redesigned to permit use of larger susceptors and to facilitate assembly, disassembly, and cleaning. Initial attempts to prepare p-type epitaxial InP films on single-crystal InP substrates met with only limited success until a new source of diethylzinc (DEZn) was obtained and installed on the system, after which active Zn concentrations (i.e., measured hole concentrations) in the 10^{17} cm^{-3} range were produced in epitaxial films on (100), 111A), and (111B) InP substrates in the deposition temperature range 715 to 730°C. The films have been characterized by x-ray and electron diffraction analyses, examination in the scanning electron microscope, and determination of transport properties by Hall-effect measurements using the van der Pauw method. Results of these investigations are reviewed.

31791 (DOE/ET/23045—2) **Chemical vapor deposition of thin-film polycrystalline Si for low-cost solar cells. Second quarterly technical progress report for period November 3, 1979 through February 1, 1980.** Ruth, R.P.; Simpson, W.I.; Yang, J.J.J.; Moudy, L.A.; Johnson, R.E. (Rockwell International Corp., Anaheim, CA (USA). Electronic Devices Div.). Feb 1980. Contract AC03-79ET23045. 66p. NTIS, PC A04/MF A01.

A research program is in progress for the development of thin-film polycrystalline Si solar cells on low-cost substrate material. The results of the second quarter of work are described. The main emphasis has been on investigation of the transport properties of p-type polycrystalline Si films (formed by SiH_4 pyrolysis in H_2) as functions of grain size and acceptor doping concentration. The study has involved preparation of sets of polycrystalline films grown simultaneously on polycrystalline high-purity alumina substrates in a range of average grain sizes ($\sim$ 1 μm to $\sim$ 125 μm) and with a range of impurity doping concentrations from $\sim$ 10^{15} to $>10^{20}$ cm^{-3}, primarily at $\sim$ 985°C. The doping concentrations are deduced from measurements of free carrier concentrations in simultaneously grown and identically doped single-crystal films on single-crystal alumina (i.e., sapphire) substrates. In addition to room-temperature measurements of resistivity and carrier concentration (and thus Hall mobility) made routinely on all of the films, selected sets of films have been characterized in detail by measurements as a function of sample temperature in the range 77 to 420°K. The results to date confirm many of the features of the grain-boundary trapping model for conduction in polycrystalline Si, including the existence of a mobility minimum for an impurity doping concentration the magnitude of which varies with the average grain size in the film, the existence of barriers in the grain boundaries with heights that also are a function of doping concentration, and a strong dependence of free carrier concentration on the impurity doping concentration for values below that for which the mobility is a minimum. There are some pronounced differences in detail between the experimental results and the model, however, including that for the apparent area density of traps in the grain boundaries.

31792 (DOE/JPL—1012-42) **Low-Cost Solar Array Project. Progress report 14, August 1979-December 1979 and proceedings of the 14th Project Integration Meeting.** (Jet Propulsion Lab., Pasadena, CA (USA)). 1980. Contract A101-76ET20356. 529p. (JPL-PUB—80-21). NTIS, PC A23/MF A01.

Progress made by the Low-Cost Solar Array Project during the period August through November 1979, is described. Progress on project analysis and integration; technology development in silicon material, large-area sheet silicon, and encapsulation; production process and equipment development; engineering, and operations, and the steps taken to integrate these efforts are detailed. A report on the Project Integration Meeting held December 5-6, 1979, including copies of the visual materials used, is presented.

31793 (DOE/JPL—1012-47) **Price allocation guidelines January 1980: Low-cost solar array project.** Aster, R.W. (Jet Propulsion Lab., Pasadena, CA (USA)). 15 Jan 1980. Contract A101-76ET20356. 30p. NTIS, PC A03/MF A01.

The price allocation guidelines (PAG) are an integrated set of specific cost targets for several task areas within the Low-cost Solar Array (LSA) Project. PAG is a working tool of LSA Project management designed to provide consistent and meaningful guidelines for costs of polycrystalline silicon material, sheet, cells, encapsulants, and module manufacturing. It is expected that advanced photovoltaic concepts derived from industry and the research community can be developed so that it will be possible by the end of 1982 to demonstrate production processes, all process steps, and prototype equipment required to manufacture flat-plate photovoltaic modules. This demonstration would incorporate production rates and product quality consistent with a specific market price determined by the program. This stage of development has been referred to as Technical Readiness. A goal of $0.70 per peak watt (1980 dollars) has been established for the cost of electricity generated by photovoltaic modules. The processes for producing modules demonstrated to be technically ready must be amenable to scale-up so that this price goal can eventually be achieved in the marketplace. The

guidelines described in this document allocate portions of that goal to each module component. Sheet materials derived from the following five technologies are considered: Czochralski, heat exchanger method (HEM), edge-defined film growth (EFG), dendritic web, and silicon on ceramic (SOC). Each type of material provides a unique combination of projected silicon yield, cell efficiency, and module packing efficiency. Also included are tables describing actual inflation rates from 1975 to 1979, and projected inflation rate to mid-1980. Project goals are now expressed in 1980 dollars rather than 1975 dollars, and these tables enable conversion of dollar amounts from prior years (1974 to 1980) to their 1980 or 1975 equivalents.

31794 (DOE/JPL/954331—80/11) **Silicon materials task of the Low-Cost Solar Array Project (Phase IV). Effects of impurities and processing on silicon solar cells. Nineteenth quarterly report, April 1980-June 1980.** Hopkins, R.H.; Davis, J.R.; Rohatgi, A.; Campbell, R.B.; Rai-Choudhury, P.; Hanes, M.H.; Mollenkopf, H.C.; McCormick, J.R. (Westinghouse Research and Development Center, Pittsburgh, PA (USA); Hemlock Semiconductor Corp., MI (USA)). Jul 1980. Contract NAS-7-100-954331. 54p. NTIS, PC A04/MF A01.

The overall objective of this program is to define the effects of impurities, various thermochemical processes, and any impurity-process interactions upon the performance of terrestrial solar cells. The results of the study form a basis for silicon producers, wafer manufacturers, and cell fabricators to develop appropriate cost-benefit relationships for the use of less pure, less costly solar grade silicon. Nine 4 ohm-cm p type silicon ingots were grown and evaluated in support of the experimental program this quarter. Of these, three were polycrystalline ingots doped with Cr, Mo, and V, respectively, produced under conditions which successfully eliminated the metal-rich inclusions formed when growth of these heavily-doped specimens was attempted during the last quarter. Evaluation of polycrystalline ingots doped to the mid 10^{13} cm^{-3} range with Ti or V showed little evidence for grain boundary segregation. Deep level spectroscopy on both as-grown wafers and solar cells showed little variation in impurity concentration from place to place across the ingot regardless of the presence of grain boundaries or other structural features. Deep level spectroscopy was also used to monitor the electrically active impurity concentrations in ingots to be used for process studies, aging experiments, and high efficiency cells. The basic aspects of a model to describe efficiency behavior in high efficiency cells have been formulated and a computer routine is being implemented for back field type devices to analyze the functional relationships between impurity concentrations and cell performance.

31795 (DOE/JPL/954334—79/13) **Experimental process system development unit for producing semiconductor-grade silicon using the silane-to-silicon process. Quarterly progress report, October-December 1979.** (Union Carbide Corp., New York (USA)). 1979. Contract NAS-7-100-954334. 56p. NTIS, PC A04/MF A01.

This program consists of the engineering design, fabrication, assembly, operation, economic analysis, and process support R and D for an Experimental Process System Development Unit (EPSDU). EPSDU equipment specification, vendor development, and evaluation of quotations represent a significant effort which will permit the start of ordering EPSDU equipment during the next quarter. Initial mini-burner test results are encouraging. It appears that a fairly simple and cost-effective waste treatment system may be possible. Engineering design packages such as the P and I, electrical one-line, and layout are also progressing well. The free-space reactor PDU was assembled and is undergoing checkout. The modified seal and shaft of the reactor scraper ran with limited success. A computer modeling of the PDU has been prepared using a two-dimensional axisymmetric model with recirculation. Some test runs have been made. Work on determination of the critical silane decomposition in a fixed bed has been completed. The data generated follow the extension of the Murthy's data. This data, along with the deposition rate data to be acquired, will be used in the fluid-bed reactor design. Present test data show that capacitive heating of the fluid bed and particle separation in a boot are very promising.

31796 (DOE/JPL/954339—80/19) **Evaluation of selected chemical processes for production of low-cost silicon (Phase III). Silicon material task Low-Cost Solar Array Project. Nineteenth quarterly progress report, April 1-June 30, 1980.** Blocher, J.M. Jr.; Browning, M.F.; Seifert, D.A. (Battelle Columbus Labs., OH (USA)). 31 Jul 1980. Contract NAS-7-100-954339. 18p. NTIS, PC A02/MF A01.

Early in this report period, the PDU was operated for a short time (one-half hour) before downstream constrictions prompted termination. The problem was traced to malfunction of the wetted-wall by-product condenser owing to the zinc chloride having a higher-than-anticipated viscosity near its melting point. Since then, a number of problems, minor in origin but major in effect, have hampered operation of the PDU. Steps are being taken to correct these deficiencies of design or mode of operation as they are revealed. Mathematical models were developed for testing against the data on the removal of zinc from silicon granules by vacuum heat treatment. With a suitable model confirmed, it will be possible to extrapolate the results to the larger particle size and different zinc content expected in the eventual product.

31797 (DOE/JPL/954343—80/18) **Process feasibility study in support of silicon material, Task I. Quarterly technical progress report (XVIII), December 1, 1979-February 29, 1980.** Yaws, C.L.; Li, K.Y. (Lamar Univ., Beaumont, TX (USA). Dept. of Chemical Engineering). Mar 1980. Contract NAS-7-100-954343. 35p. NTIS, PC A03/MF A01.

Analyses of process system properties were continued for important chemical materials involved in the several processes under consideration for semiconductor and solar cell grade silicon production. Major activities were devoted to physical, thermodynamic and transport property data for silicon. Property data are reported for vapor pressure heat of vaporization, heat of sublimation, liquid heat capacity and solid heat capacity as a function of temperature to permit rapid usage in engineering. Chemical engineering analysis of the HSC process (Hemlock Semiconductor Corporation) for production of silicon was initiated. The process is based on hydrogen reduction of dichlorosilane (DCS) to produce the polysilicon. The chemical vapor deposition reaction for DCS is faster in rate than the conventional process route which utilizes trichlorosilane (TCS) as the silicon raw material. Status and progress are reported for primary activities of base case conditions (30%), reaction chemistry (25%) and process flow diagram (20%). Discussions with HSC and construction of a process flow diagram are in progress. Preliminary economic analysis of the BCL process (case B) was completed. Cost analysis results are presented based on a preliminary process design of a plant to produce 1000 metric tons/year of silicon. Fixed capital investment for the plant is $14.35 million (1980 dollars) and product cost without profit is 11.08 $/kg of silicon (1980 dollars). Cost sensitivity analysis indicate that the product cost is influenced most by plant investment and least by labor. For profitability, a sales price of 14 $/kg (1980 dollars) gives a 14% DCF rate of return on investment after taxes.

31798 (DOE/JPL/954356—80/13) **Silicon-on ceramic process: silicon sheet growth and device development for the large-area silicon sheet task of the Low-Cost Solar Array Project. Quarterly report NO. 15, April 1, 1980-June 30, 1980.** Whitehead, A.B.; Zook, J.D.; Grung, B.L.; McHenry, K.; Schuldt, S.B.; Chapman, P.W. (Honeywell Corporate Material Sciences Center, Bloomington, MN (USA)). 31 Jul 1980. Contract NAS-7-100-954356. 67p. NTIS, PC A04/MF A01.

The objective of this research is to investigate the technical feasibility of producing solar-cell-quality sheet silicon which could meet the DOE cost goals. The Honeywell approach is to coat one surface of carbonized ceramic substrates with a thin layer of large-grain polycrystalline silicon from the melt. Results and accomplishments which occurred during the quarter can be summarized as follows: (1) two major problems associated with SCIM-coating wide (10-cm) substrates were identified and solved; (2) the longitudinal temperature profile in SCIM-II has been improved to prevent substrate warping, buckling, and cracking; (3) the transverse temperature profile in SCIM II has been improved to produce more uniform coatings; (4) a strategy to eliminate effects of thermal stress has been developed; (5) the best SOC cell has a total-area conversion efficiency of 10.5% (AM1, AR), for a cell area of 5 cm^2; (6) a number of experiments are being investigated for improving cell efficiency; (7) for the slow-cooldown experiment, the average efficiency of 29 AR-coated cells was 9.9%, with a standard deviation of 0.3%; (8) encouraging results were obtained on SOC material that had been treated in a hydrogen plasma at Sandia; and (9) thermal modeling has proven to be beneficial in designing modifications of SCIM II.

31799 (DOE/JPL/954374—10) **Slicing of silicon into sheet material. Final report, January 9, 1976-September 30, 1979.** Fleming, J.R.; Holden, S.C.; Wolfson, R.G. (Varian Associates, Lexington, MA (USA). Lexington Vacuum Div.). 21 Sep 1979. Contract NAS-7-100-954374. 568p. NTIS, PC A24/MF A01.

Complete results, from raw data to interpretation to recommendations, of a program to investigate the use of multiblade slurry sawing to produce silicon wafers from ingots are presented. During the course of this program, the commercially available state of the art process was improved by 20% in terms of area of silicon wafers produced from an ingot. The process was improved 34% on an experimental basis. Production of 20 wafers per centimeter length of 100 mm diameter ingot is now possible on a production basis. Economic analyses presented show that further improvements are necessary to approach the desired wafer costs, mostly reduction in expendable materials costs. Tests which indicate that such reduction is possble are included, although demonstration of such reduction was not completed. A new, large capacity saw was designed and tested. Performance comparable with current equipment (in terms of number of wafers/cm) was demonstrated. Improved performance was partially demonstrated, but problems (both mechanical and of unknown origin) precluded full demonstration of improved performance.

31800 (DOE/JPL/954777—80/8) **Silicon halide-alkali metal flames as a source of solar grade silicon. Final report.** Olson, D.B.; Miller, W.J.; Gould, R.K. (Aerochem Research Labs., Inc., Princeton, NJ (USA)). Jan 1980. Contract NAS-7-100-954777. 73p. (AeroChem-TP—395). NTIS, PC A04/MF A01.

The object of this program was to determine the feasibility of using continuous high-temperature reactions of alkali metals and silicon halides to produce silicon in large quantities and of suitable purity for use in the production of photovoltaic solar cells. Equilibrium calculations showed that a range of conditions were available where silicon was produced as a condensed phase but the byproduct alkali metal salt was a vapor. A process was proposed using the vapor phase reaction of Na with $SiCl_4$. Low pressure experiments were performed demonstrating that free silicon was produced and providing experience with the construction of reactant vapor generators. Further experiments at higher reagent flow rates were performed in a low temperature flow tube configuration with co-axial injection of reagents. Relatively pure silicon was produced in these experiments. A high temperature graphite flow tube was built and continuous separation of Si from NaCl was demonstrated. A larger-scaled well-stirred reactor was built. Experiments were performed to investigate the compatibility of graphite-based reactor materials of construction with sodium. At 1100 to 1200 K none of these materials were found to be suitable. At 1700 K the graphites performed well with little damage except to coatings of pyrolytic graphite and silicon carbide which were damaged.

31801 (DOE/JPL/954853—79/8) **Investigation of proposed process sequence for the array automated assembly task: Phase II. Quarterly technical progress report for quarter ending December 29, 1979.** Mardesich, N.; Bunyan, S.; Sipperly, B. (Spectrolab, Inc., Sylmar, CA (USA)). Feb 1980. Contract NAS-7-100-954853. 32p. NTIS, PC A03/MF A01.

A sulfur hexaflouride plasma etch was investigated as a possible surface treatment to improve the performance of the cell, the Radiation Technology Infrared Furnace was qualified for use in the process sequence, and work was initiated on junction clean up by laser scribing through the junction. An evaluation of the minority carrier diffusion length of silicon crystals received from various vendors was also included in this quarters activities. Results are presented and discussed.

31802 (DOE/JPL/954854—80/7) **Phase 2 of the array automated assembly task for the Low Cost Silicon Solar Array Project. Seventh quarterly report.** Petersen, R.C. (Solarex Corp., Rockville, MD (USA)). Jul 1980. Contract NAS-7-100-954854. 41p. NTIS, PC A03/MF A01.

Work during this quarter emphasized the evaluation of the Motorola metallization process, the major experimental task of the program. The Motorola process is a lengthy one, designed to assure reproducible metallization of solar cells, but it was found difficult to reproduce relative to a single step electroless nickel plating. It is also concluded, on the basis of experiments performed to date, that the product of the Motorola process is virtually identical to the product of a simple electroless nickel plating process.

31803 (DOE/JPL/954862—79/8) **Development of a model and computer code to describe solar grade silicon production processes. Final report.** Gould, R.K.; Srivastava, R. (Aerochem Research Labs., Inc., Princeton, NJ (USA)). Dec 1979. Contract NAS-7-100-954862. 127p. (AeroChem-TP—392). NTIS, PC A07/MF A01.

Models and computer codes which may be used to describe flow reactors in which high purity, solar grade silicon is produced via reduction of gaseous silicon halides are described. A prominent example of the type of process which may be studied using the codes developed in this program is the $SiCl_4$/Na reactor currently being developed by the Westinghouse Electric Corp. During this program two large computer codes were developed. The first is the CHEMPART code, an axisymmetric, marching code which treats two-phase flows with models describing detailed gas-phase chemical kinetics, particle formation, and particle growth. This code, based on the AeroChem LAPP (Low Altitude Plume Program) code can be used to describe flow reactors in which reactants mix, react, and form a particulate phase. Detailed radial gas-phase composition, temperature, velocity, and particle size distribution profiles are computed. Also, depositon of heat, momentum, and mass (either particulate or vapor) on reactor walls is described. The second code is a modified version of the GENMIX boundary layer code which is used to compute rates of heat, momentum, and mass transfer to the reactor walls. This code lacks the detailed chemical kinetics and particle handling features of the CHEMPART code but has the virtue of running much more rapidly than CHEMPART, while treating the phenomena occurring in the boundary layer in more detail than can be afforded using CHEMPART. These two codes have been used in this program to predict particle formation characteristics and wall collection efficiencies for $SiCl_4$/Na flow reactors. Results are described.

31804 (DOE/JPL/954877—78/3) **Study program to develop and evaluate die and container materials for the growth of silicon ribbons.** Addington, L.A.; Ownby, P.D.;Yu, B.B.; Barsoum, M.W.; Romero, H.V.; Zealer, B.G. (Eagle-Picher Industries, Inc., Miami, OK (USA). Miami Research Labs.). Dec 1979. Contract NAS-7-100-954877. 129p. NTIS, PC A07/MF A01.

The Large Area Silicon Sheet Growth Task objective of lowering the cost of silicon photovoltaic material requires the development of materials which exhibit improved chemical and dimensional stability in contact with molten silicon. These materials may find application as containers and/or shaping dies in processes such as edge-defined film growth. The development and evaluation of proprietary coatings of pure silicon carbide, silicon nitride and aluminum nitride on less pure hot pressed substrates of the respective ceramic materials are described. Silicon sessile drop experiments were performed on coated test specimens under controlled oxygen partial pressures. X-ray diffraction and SEM Characterization was performed prior to testing. The reaction interfaces were characterized after testing with optical and scanning electron microscopy and Auger electron spectroscopy. Increasing the oxygen partial pressure was found to increase the molten silicon contact angle, apparently because adsorbed oxygen lowers the solid-vapor interfacial free energy. Adsorbed oxygen was also found to increase the degree of attack of molten silicon upon the chemical vapor deposited coatings. Prototypic containers and dies were delivered and cost projections show that reasonably priced, coated, molten silicon resistant refractory material shapes are obtainable.

31805 (DOE/JPL/954886—80/11) **LSA large area silicon sheet task continuous liquid feed Czochralski growth. Quarterly report, April-June 1980.** Walters, D. (Siltec Corp., Menlo Park, CA (USA)). Jul 1980. Contract NAS-7-100-954886. 24p. NTIS, PC A02/MF A01.

The purpose of this phase of the continuous liquid feed program is the design and development of equipment and processes in order to ultimately demonstrate the continuous growth of crystals, by the use of the Czochralski method, suitable for producing monocrystalline silicon for use in solar cells. This involves the growth of at least 150 kg monocrystalline silicon ingots, 150 mm in diameter, obtained from a single growth container. Our approach to meeting this goal is to develop a furnace with continuous liquid replenishment to the growth crucible. Demonstrations using the silicon polyrod feed mechanism continued this quarter providing continuous melt replenishment to the meltdown chamber, subsequent transfer of this melt, and the simultaneous growth of silicon ingots in the growth chamber. The frame to the CLF furnace was extended in order to accommodate 50 kg crystal ingots above the gate valve, hence enabling us to accomplish our goal of 150 kg throughput. Development work continued on various aspects of the melt transfer system.

31806 (DOE/JPL/954888—79/9) **Continuous Czochralski growth: silicon sheet growth development of the large area silicon sheets task of the Low Cost Silicon Solar Array Project. Ninth quarterly progress report, October 1-December 31, 1979.** Lane, R.L.; Roberts, E. (Kayex Corp., Rochester, NY (USA)). 1979. Contract NAS-7-100-954888. 32p. NTIS, PC A03/MF A01.

During this reporting period, four more 100 kg continuous runs were completed to satisfy the six required by the project extension. One of the four (2*) was performed using a new standard CG2000 RC grower, using accessory equipment and process techniques developed under this project. The sixth and final 100 kg continuous run was performed with purified carbon parts and resulted in the best results to date. Run No. 62 resulted in 103.0 kg being pulled from 104.5 kg total charge weight (98.6% pulled yield). Of this 103 kg grown, 89.3 kg were monocrystalline. Moreover, 72.2 kg was OD material. Another encouraging result was that 85% of the eighth crystal was monocrystalline and 67% of the ninth and last crystal was monocrystaline after ninety seven hours of continuous growth. Impurity analysis data indicate that impurity build-up in grown crystals during 100 kg continuous runs is insignificant. However, the results indicate that impurities tend to accumulate in the crucible. Moreover, impurity analysis performed on new crucibles indicates that these new crucibles may not be as pure as the manufacturer's literature states. Solar cell efficiency data from two 100 kg continuous runs were received this quarter with very encouraging results. The average efficiencies of all cells tested was 16.35% AM1, which is considerably higher than our 14% AM1 goal. Moreover, the efficiencies remained at or near the same levels throughout the entire 100 kg continuous run. We expect to receive solar cell efficiency results from three more of the 100 kg continuous runs in the next quarter.

31807 (DOE/JPL/955089—80/7) **Silicon solar cell process development, fabrication and analysis. Sixth quarterly progress report, 1 January-31 March 1980.** Yoo, H.I.; Iles, P.A.; Ho, F.F. (Optical Coating Lab., Inc., City of Industry, CA (USA). Photoelectronics Div.). 1980. Contract NAS-7-100-955089. 72p. NTIS, PC A04/MF A01.

Solar cells were fabricated from HEM (Crystal Systems), SOC (Honeywell) and semi-continuous CZ wafers (HAMCO), and their performance was characterized. Shallow junction, BSF and gettering steps were applied on HEM wafers, resulting in significant enhancement in carrier collection (Jsc) by the gettering process. Improvement in efficiency was achieved on SOC solar cells by increasing active area of the cells (Photoresist techniques were used instead of metal shadow mask). Standard HAMCO solar cells were fabricated on wafers from one of HAMCO's 100kg continuous runs. Performance of the solar cells, as a function of ingot growth sequence and position within the ingots, indicated; (1) single crystalline HAMCO cells showed efficiency the same as conventional CZ control cells (usually even higher efficiencies were observed), (2) no significant performance degradation was observed on the cells from the last grown ingot, and (3) cells made from poly crystalline sections indicated lower conversion efficiency. The BSF study showed that the higher the resistivity of the starting substrates, the greater the relative improvement in cell performance, probably because of greater shift in Fermi levels at the back L/H junction (pp^+) and the higher values of initial minority carrier diffusion length. This study also suggested that proper control of the BSF process could minimize the junction shunting problems.

31808 (DOE/JPL/955282—80/6) **LSA large area silicon sheet task enhanced I.D. slicing. Quarterly report No. 6, April-June 1980.** Walters, D. (Siltec Corp., Menlo Park, CA (USA)). Jul 1980. Contract NAS-7-100-955282. 26p. NTIS, PC A03/MF A01.

The purpose of this program is to develop and demonstrate enhanced I.D. slicing that will significantly increase the number of usable slices per inch of ingot over industry practice. This process requires a reduction in both blade and slice thickness and will be achieved through a combination of three key slicing technology elements: ingot rotation with minimum exposed blade area, dynamic cutting edge control, and the use of prefabricated insert blades. Demonstration runs continued this quarter on schedule. All runs utilized the principle of ingot rotation, with the incorporation of the cutting edge position control mechanism for precision slicing. Blade development and the pursuit of a functional wafer retrieval system continued as well.

31809 (DOE/JPL/955491—80/1) **Development of processes for the production of solar grade silicon from halides and alkali metals. First quarterly report, October 3-December 31, 1979.** Dickson, C.R.; Gould, R.K. (Aerochem Research Labs., Inc., Princeton, NJ (USA)). Feb 1980. Contract NAS-7-100-955491. 15p. NTIS, PC A02/MF A01.

This program is directed toward the development of processes involving high temperature reactions of silicon halides with alkali metals for the production of solar grade silicon in volume at low cost. Experiments are being performed to evaluate product separation and collection processes, measure heat release parameters for scaling purposes, determine the effects of reactants and/or products on materials of reactor construction, and make preliminary engineering and economic analyses of a scaled-up process. Samples of the silicon product will be delivered to JPL for evaluation of solar cell performance. During this reporting period the silicon reactor test apparatus reached operational capabilities after a shutdown for two months. Several design improvements were made while returning it to an operational stage. During the initial series of experiments complete product separation of the silicon from the salt was achieved and small samples ($\approx$ 3 to 40 g) of fused silicon were collected. The test apparatus is now being operated on a routine basis for periods of about twenty minutes. Finally, the initial work began on the engineering and economic analysis for scale-up of the silicon production process.

31810 (DSE—4042-T3) **Development of polycrystal GaAs solar cells. Quarterly technical progress report No. 1, January 15-April 30, 1979.** Miller, D.L.; Cohen, M.J.; Harris, J.S. Jr.; Ballantyne, J.; Hoyte, A.; Stefanakos, E. (Rockwell International Corp., Thousand Oaks, CA (USA). Electronics Research Center). May 1979. Contract EG-77-C-01-4042. 46p. NTIS, PC A03/MF A01.

The objective of this program is to develop a thin film GaAs solar cell technology with the potential of yielding cells with 12 to 15% efficiency and to develop thin film growth techniques which are compatible with the low cost production goal of $500/kW-peak. Progress is reported on a study of junction formation in large grain polycrystal GaAs; characterization of the electronic properties of polycrystal GaAs grown by MBE on low cost foreign substrates; optimizing the structure of AlGaAs-GaAs heterojunction Schottky barrier solar cells; and a variety of grain boundary measurements, including Scanning Light Microscopy (SLM), Deep Level Transient Spectroscopy (DLTS), SIMS, and temperature dependent resistivity.

31811 (DSE—4042-T7) **Development of polycrystal GaAs solar cells. Quarterly technical progress report No. 2 for May 1-July 31, 1979.** Miller, D.L.; Cohen, M.J.; Harris, J.S. Jr.; Ballantyne, J.; Hoyte, A.; Stefanakos, E. (Solar Energy Research Inst., Golden, CO (USA)). Sep 1979. Contract EG-77-C-01-4042. 74p. NTIS, PC A04/MF A01.

Investigation of grain boundaries in GaAs, growth of small-grained GaAs, and solar cell fabrication on small-grained material continued this quarter. Some highlights were the fabrication of MS cells of small-grained GaAs grown on Mo, the fabrication of MIS cells using spin-on oxides, and the determination of interface state density at a high-resistance grain boundary. Initial measurements show that series resistance and shunt leakage seriously degrade the performance of cells made from small-grain polycrystal MBE GaAs, leading to efficiencies less than 1%.

31812 (DSE—4042-T9) **Indium phosphide/cadmium sulfide thin-film solar cells. Quarterly technical progress report No. 1, June 1979-August 1979 .** Zanio, K. (Hughes Research Labs., Malibu, CA (USA)). Nov 1979. Contract EG-77-C-01-4042. 23p. NTIS, PC A02/MF A01.

Cadmium sulfide and InP thin films were prepared by thermal evaporation and planar reactive deposition, respectively. Polycrystalline CdS films up to 10 μm thick showed absorption losses of less than 10% over the 0.6- to 1.0-μm wavelength range. A threefold increase in lateral grain size was achieved when CdS/ITO/GLASS structures were partially recrystallized in flowing H_2S/Ar at 550°C. InP deposited onto (100) InP semiinsulating substrate at substrate temperatures as low as 260°C was n-type with room-temperature mobilities as high as 1500 cm^2/Vsec. The CdS and InP films were integrated into an all-thin-film InP/CdS/ITO/GLASS structure.

31813 (DSE—4042-T20) **Spray solar cell research: CdS/Cu_2S cells by ion exchange-CSD. Quarterly report No. 1, October 1-December 31, 1979.** Maruska, H.P.; Young, A.R. II. (Exxon Research and Engineering Co., Linden, NJ (USA). Advanced Energy Systems Labs.). 1979. Contract EG-77-C-01-4042. 44p. NTIS, PC A03/MF A01.

A study of the applicability of the Chemical Spray Deposition-Ion Exchange Technique to the formation of high efficiency, low cost Cu_2S/CdS solar cells has been undertaken. A Chemical Spray Deposition (CSD) apparatus and an Ion Exchange annealing station have been designed, and construction of these facilities is nearing completion. The object is to form films of CdO and Cu_2O by spraying appropriate solutions onto a heated substrate, and then to convert these oxides into CdS and Cu_2S through ion exchange by annealing in H_2S vapor. Such films will then be the basis for fabricating Cu_2S/CdS solar cells. Temporary spray and annealing equipment has been used while the permanent facilities are completed. CdO oxide films with thicknesses of 0.1 to 0.5 microns have been deposited. There is preferred crystal growth in the [111] direction on glass substrates. However, on SnO_2 coated glass, a [200] preferred orientation is obvious. The crystallite size is 5 to 10 microns, and porous spheres 10 to 20 microns in diameter are visible on the surface. After annealing in H_2S, the films are converted to CdS, but the reaction is not complete after 2 h. The optical transmission is now characteristic of CdS. The grain size was found to increase to the 100 micron range, but the surface spheres remain. A mixture of CuO and Cu_2O was formed in a preliminary spraying. The film converted to the digenite and djurleite phases of copper sulfide. Much improved control of the deposition process will result when the permanent facilities come on-line.

31814 (DSE—4042-T22) **Supported growth of polycrystalline silicon sheet on low-cost ceramic, carbon, or reusable substrate. Quarterly report No. 1, September 26-December 31, 1979.** Chapman, P.W.; Heaps, J.D.; Schuldt, S.B.; Zook, J.D. (Honeywell Corporate Material Sciences Center, Bloomington, MN (USA)). 1 Feb 1980. Contract EG-77-C-01-4042. 36p. NTIS, PC A03/MF A01.

The overall objective of this program is to identify and develop high-throughput, supported-growth methods for producing low-cost, large-area polycrystalline silicon sheet on ceramic, carbon, or reusable substrates. The first method being investigated is the SCIM coating technique. (SCIM is an acronym for Silicon Coating by Inverted Meniscus.) With this technique, a low-cost ceramic substrate is silicon-coated in a continuous manner by passing the substrate over a molten silicon meniscus which is contained in a narrow fused-silica trough. During this reporting period, several mullite substrates were silicon-coated with this method. The best coatings were approximately 100 μm thick with large columnar grains up to 0.5 cm wide and several cm long. Structural characterization of these coatings shows that these large grains are heavily twinned with boundaries perpendicular to the surface of the layer. Minority-carrier diffusion length measurements made on photodiodes fabricated from these coatings indicate diffusion lengths of about 25 μm. The short-circuit current densities of the diodes were about 23 mA/cm^2, with open-circuit voltages of approximately 0.49 V. With the substrates positioned horizontally as they pass over the meniscus trough, instability usually occurs, causing a buildup of molten silicon immediately downstream from the trough. This silicon eventually spills over onto key parts of the coater. By tilting the substrate at angles of 10, 15, and 20°, stability can be achieved. A theoretical study of meniscus shapes conducted during this reporting

period suggests that with an appropriate trough design and the right pressure and substrate height, a SCIM-coating with horizontal substrates should also be possible.

31815 (DSE—4042-T27) **Cadmium sulfide/copper sulfide heterojunction cell research. Quarterly technical progress report, October 1-December 31, 1979.** Thornton, J.A. (Solar Energy Research Inst., Golden, CO (USA)). 28 Feb 1980. Contract EG-77-C-01-4042. 35p. NTIS, PC A03/MF A01.

Extensive modifications to the multi-source reactive sputtering deposition apparatus, including the installation of a larger vacuum chamber on the existing pumping system, have been completed. The new chamber provides improved inter-source shielding, an improved substrate mounting and heating system, and a vacuum interlock for introducing substrates. The investigation of CdS resistivity control by In doping has been continued. It has been established that the resistivity of CdS coatings deposited from an In doped target by reactive sputtering in an Ar - H_2S working gas is very sensitive to the H_2S injection rate. Thus coatings varying in resistivity from 10^3 Ω-cm to 10^{-1} Ω-cm were deposited from a target doped with 1 at. % In as the H_2S injection rate was varied by only 25%. Microprobe analysis confirmed that the In content in the coatings was identical to that in the target. The resistivity variations are believed to result from variations in the Cd vacancy level and the associated vacancy acceptor compensation of the In donors. The sputter-deposited solar cells fabricated thus far are characterized by a low short circuit current. Cell current-voltage characteristics and capacitance-voltage measurements under solar illumination indicate that the cause is a poor junction collection efficiency due primarily to a low junction electric field in the heat-treated cells.

31816 (DSE—4106-T1) **Development of silicon recrystallization and thin-film solar cell processes. Third quarterly technical status report, April 1-June 30, 1978.** Solomon, S.J. (Spire Corp., Bedford, MA (USA)). Nov 1978. Contract EG-77-C-01-4106. 52p. NTIS, PC A04/MF A01.

This report reviews the rationale for selection of the two-step recrystallization process that is being developed, presents the results of the latest first-step recrystallization experiments, and outlines the calculations appropriate to the design of second-step thermal process experiments. Results of a computer run for first-step recrystallization are also presented. The report concludes with an updating of the results obtained from the thermal and pulsed electron beam annealing of shallow implanted GaAs.

31817 (DSE—8033-1/3) **Cadmium sulfide/copper sulfide heterojunction cell research. Technical progress report, September 1-November 30, 1979.** Anderson, W.W.; Jonath, A.D. (Lockheed Missiles and Space Co., Palo Alto, CA (USA). Research Labs.). Feb 1980. Contract EG-77-C-01-4042. 38p. (LMSC-D—682102). NTIS, PC A03/MF A01.

Several all sputter deposited Cu_2S/CdS cells have been prepared to date with J/sub SC/ ≅ 3 mA/cm^2 under simulated AM1 illumination. The best AM1 conversion efficiency obtained is 0.6%. This is shown to be typical of sputtered CdS in Cu_2S/CdS cells investigated to date. The sputtered Cu_2S appears to be satisfactory for solar cell applications. Presented evidence indicates that the poor conversion efficiency is due to a low-junction electric field intensity on the CdS side of the heterojunction. A multilayer CdS structure has been developed which may allow the tailoring of the junction electric field intensity to a selected high value to obtain high-junction collection efficiency. Other areas of cell development advances included: (1) determination of effect of Cu cones in Cu_2S on Cu_2S/CdS cell performance; (2) solution of CdS pinhole problem; and (3) open circuit voltage improvement by heat treatment.

31818 (HEDL-TC—1548) **Current solar cell measurement methods review and evaluation.** Green, D.R.; Michaels, T.E.; Olsen, L.C.; Price, L.S. (Hanford Engineering Development Lab., Richland, WA (USA)). May 1980. Contract AC14-76FF02170. 159p. NTIS, PC A08/MF A01.

Selected measurement methods commonly applied to solar cells are studied. Basic theoretical models are emphasized, and methods for determining important parameters are outlined. Methods are reviewed for measurement of resistivity, Hall effect, Seebeck effect, dark current-voltage characteristics, illuminated current-voltage characteristics, and spectral photoresponse. State-of-the-art in each area is reviewed. (WHK)

31819 (SAN—1712-1) **Development of high efficiency GaAs polycrystal solar cells. Quarterly technical report No. 1, January 23-April 23, 1978.** (Rockwell International Corp., Thousand Oaks, CA (USA). Science Center). 20 Jun 1978. Contract ET-78-C-03-1712. 51p. NTIS, PC A04/MF A01.

The objective of this program is to develop a thin film polycrystal GaAs solar cell technology with the potential of yielding cells with 12 to 15% efficiency and to develop thin film growth techniques which are compatible with the low cost production goal of $100-300/KW peak. During the first quarter, we have emphasized the application of high spatial resolution Auger spectroscopy, SIMS, scanning light microscopy and pulsed laser measurements to measure the chemical and electrical transport properties at grain boundaries in GaAs. These techniques are described and the first measurement of grain boundary resistance is reported. We have also successfully grown highly oriented polycrystal GaAs on graphite with a columnar grain structure by molecular beam epitaxy (MBE). This growth technique and preliminary characterization on the MBE layers are described.

31820 (SAN—1712-3) **Development of high efficiency GaAs polycrystal solar cells. Quarterly technical and topical report No. 3, July 24-October 23, 1978.** (Rockwell International Corp., Thousand Oaks, CA (USA). Science Center). Jan 1979. Contract ET-78-C-03-1712. 54p. NTIS, PC A04/MF A01.

The objectives of this program are to develop a thin film polycrystal GaAs solar cell technology with the potential of yielding cells with 12 to 15% efficiency and to develop thin film growth techniques which are compatible with the low cost production goal of $100-300/KW peak. During this quarter, measurements of the electronic properties of polycrystal GaAs were continued. Progress has been made in achieving a theoretical understanding of majority and minority carrier transport at grain boundaries. Studies have been initiated of various solar cell structures on polycrystal GaAs such as MOS and M-AlGaAs-GaAs Schottky barriers. A study of junction formation in polycrystal GaAs has begun using ideal Al Schottky barrier fabricated in-situ in the MBE chamber.

31821 (SAN—1712-T1) **Development of high efficiency solar cells. Final technical report, January 23, 1978-January 2, 1979.** Miller, D.L.; Cohen, M.J.; Harris, J.S. Jr.; Loferski, J.; Ballantyne, J.; Bhar, T.; Stefanakos, E. (Rockwell International Corp., Thousand Oaks, CA (USA). Science Center). Apr 1979. Contract ET-78-C-03-1712. 184p. NTIS, PC A09/MF A01.

During the first year of this program, emphasis has been on developing new polycrystal growth techniques, developing new analytical techniques to study grain boundaries and fundamental studies of the physical mechanisms by which grain boundaries limit solar cell performance. Molecular beam epitaxy (MBE) has proven to be a very attractive technique for fundamental studies of both grain boundaries and unique device structures. Several high spatial resolution analytical techniques have been developed and are providing information on the electrical properties of grain boundaries. Auger potential profiling has provided the first experimental verification of the Fermi level pinning at a grain boundary. Cathodoconductivity, photovoltage, and photocurrent measurements with a scanning laser microscope have provided data on minority carrier transport near grain boundaries. Transient capacitance and deep level transient spectroscopy measurements are yielding data on carrier lifetime, trap levels and densities at grain boundaries. The successful development of these measurement techniques is key to understanding the physics of grain boundaries. Device fabrication has been initiated during the last 6 months of the program. Initial investigation of Schottky barrier cells on large grain polycrystal GaAs revealed essentially identical results for cells which included several grain boundaries vs. those entirely within single crystal regions. The most encouraging result to date is 6.5% AM1 efficiency for a non-AR coated MIS fabricated on large grain MBE polycrystal GaAs. In addition, both ITO-oxide-GaAs and metal-AlGaAs-GaAs cells have demonstrated encouraging values of V/sub oc/ and could yield high efficiency cells.

31822 (SAN—3042-3) **Amorphous silicon solar cells by hydrogen implantation. Quarterly report No. 3, July 1-September 30, 1979.** Kirkpatrick, A.R.; Melas, A.A. (Spire Corp., Bedford, MA (USA)). Jan 1980. Contract AC03-79ET23042. 27p. NTIS, PC A03/MF A01.

During the third quarter of this program a large number of implantation matrices were evaluated and material investigations initiated. The usefulness of ion implantation in the amorphization and hydrogenation of devices was established. Indeed both of these processes can controllably and reproducibly be carried out. The amorphized material shows superior visible-light absorption behavior compared to crystalline silicon. Hydrogenation with subsequent furnace annealing produces higher open-circuit voltage, in selected devices, than the polycrystalline material. The use of infrared spectroscopy established the presence and type of silicon-hydrogen bonding. The implantation experiments will continue during the final quarter of this program, with the aim of optimizing the performance of hydrogenated amorphous silicon solar cells by ion implantation.

31823 (SAND—80-7066) **Near-term implementation of production cost reduction for photovoltaic concentrator array.** Cairns, B.R. (Varian Associates, Palo Alto, CA (USA). Solid State Lab.). Jul 1980. Contract AC04-76DP00789. 78p. NTIS, PC A05/MF A01.

Progress on the development of a standardized process for fabricating GaAs/AlGaAs concentrator solar cells at a lower cost is reported. As of the end of the program, high-quality GaAs ingots weighing 1.0 to 1.5 Kgm and 2.0 to 2.5 in. diameter were routinely grown. A high-througput liquid-phase epitaxial reactor was complet-

ed and considerable process development work was performed to characterize growth parameters. Larger-area organometallic growth of thin AlGaAs layers led to improved cell efficiencies for this material. An improved cell metallization structure and process was developed to give reliable low contact resistances, stable at temperatures of 400°C and above. The silicon nitride AR coating was also improved. Considerable effort was spent on package development to obtain a packaged cell suitable for easy installation in an array. Completely packaged cells from liquid and organometallic epitaxial material gave efficiencies in the 18 to 20% range at 440 suns concentration.

31824 (SERI/TR—8232-1-T1) **Fabrication and characterization of ITO/silicon SIS solar cells. Final report, October 1, 1978-April 30, 1980.** DuBow, J.B. (Colorado State Univ., Fort Collins (USA). Dept. of Electrical Engineering). Jun 1980. Contract AC02-77CH00178. 153p. NTIS, PC A08/MF A01.

The objectives of this research were to optimize the performance of ITO/polycrystalline silicon solar cells, identify performance limitations, identify major stability problems which would inhibit terrestrial application of these devices, evaluate the impact of indium supply and price on terrestrial applications, and evaluate the economic viability of ITO sputter deposited solar cells. These goals were successfully achieved during the course of this multipronged effort. Both area scaling with efficiency maintenance were achieved by process modifications including surface preparation and in-situ passivation techniques. Indium tin oxide on Wacker polycrystalline silicon solar cells were fabricated which achieved 13.7% efficiency for 11 cm^2 devices. Typical open circuit voltages were 0.525 volts, short circuit currents, 34 mA/cm^2, and fill factors of 0.75. In the course of this project, three device measurement techniques which assisted in improving cell efficiency and which have broad applicability to all photovoltaic devices were introduced. These were automated admittance and surface state analysis, noise spectral density analysis, and automated I-V and C-V analysis. These measurements were combined with Auger/ESCA, EBIC and flying spot scanner, and other measurement techniques to identify grain boundaries, intragrain defects, edge leakage, and interface losses which were subsequently alleviated through process improvements. It is concluded from this work that prototype production of cells and modules based on this technology would be warranted in the near term.

31825 Solar selective black cobalt: preparation, structure, and thermal stability. Smith, G.B.; Ignatiev, A.; Zajac, G. (Department of Physics, University of Houston, Houston, Texas, 77004). *J. Appl. Phys.;* **51**: No. 8, 4186-4196(Aug 1980).

In the quest for an electroplated selective black coating stable to 500 °C in air, black cobalts have been prepared by three techniques to yield (a) plated cobalt sulphides, (b) plated cobalt oxide-hydroxide, and (c) cobalt oxide prepared by thermal oxidation of electropolated cobalt metal. The optical properties of the various coatings are analyzed before and after exposure to air for extended periods of time at temperatures in the 300 °—500 °C range. The sulfide black cobalt is not acceptable as a high-temperature selective absorber due to severe thermal degradation. The plated oxide is a good selective absorber to about 400 °C, and the thermally oxidized black to a slightly higher temperature, but degrades at 500 °C. Structure studies via scanning electron microscopy (SEM), Auger electron spectroscopy (AES), and x-ray photoemission spectroscopy (XPS) are reported which yield a full account of the coating chemistry before and after heating. The studies reveal that the high solar absorptance of the acceptable black cobalt coatings is due to a continuation of a porous outer layer grading into nondense oxides of cobalt; either CoO or Co_3O_4, depending on the film. Absorption is intrinsic but not due to metal particles as in black chrome. A limited amount of optical degradation occurs upon heating the oxide black cobalt in air due to oxidation of hydroxide. However, the major degradation problem is shown to be substrate oxidation in contrast to black chrome where film oxidation is the principal problem.

31826 High-efficiency AlGaAs/GaAs concentrator solar cells by organometallic vapor phase epitaxy. Saxena, R.R.; Aebi, V.; Cooper, C.B. III; Ludowise, M.J.; Vander Plas, H.A.; Cairns, B.R.; Maloney, T.J.; Borden, P.G.; Gregory, P.E. (Varian Associates, Inc., Solid State Laboratory, Palo Alto, California 94303). *J. Appl. Phys.;* **51**: No. 8, 4501-4503(Aug 1980).

Conversion efficiency of 23% at 369 suns has been achieved for packaged AlGaAs/GaAs solar cells fabricated by organometallic vapor phase epitaxy. The design considerations and the solar cell performance in concentrated sunlight are described.

31827 Nonideal diode factors. Boeer, K.W. (University of Delaware, Newark, Delaware 19711). *J. Appl. Phys.;* **51**: No. 8, 4518-4522(Aug 1980).

It is shown that nonideal diodes with an A factor in the exponent larger than two can be explained when the junction recombination starts to saturate. In the photovoltaic cells in which the density of minority carriers can be varied indpendent of the bias voltage, this behavior becomes transparent and is used as an example for the proposed model.

31828 Advanced photovoltaic concentrator cells. Technical progress report, 1st and 2nd quarterly reports. Frank, R.; Goodrich, J. Contract XJ-9-8058-1. Burlington, MA; Microwave Associates, Inc. (1980). 78p. (NP—25003).

This report covers the first six months of the first phase of a multi-year R and D program to develop Advanced Photovoltaic Concentrator Cells using single crystal silicon. The final goal of this program is the development of a silicon cell capable of operation at 30% efficiency (at 27°C), at an incident intensity of 100 W/cm^2 in an AM2 spectrum. The objective of the first phase of th program is to fabricate the double back grooved EMVJ cell and extend the unique aspects and its cooling/interconnect mount, to demonstrate efficiencies over 22% @ 500 suns, and to show that efficiencies over 25% are realizable. The basic design approach uses a cell with (1) no obscured front surface area and the best possible AR properties, in order to obtain maximum short circuit current; (2) negligible series resistance losses in order to maintain the highest possible fill factor at high light concentration. In addition, a number of other features are incorporated, such as processing techniques which achieve long minority carrier lifetimes, leading to high values of open circuit voltage. The basic structure is based on the EMVJ (etched, multiple vertical junction) design. In this cell, narrow vertical-walled grooves are etched from the front surface and the groove walls are subsequently p+ diffused and heavily plated. The entire back surface receives an n+ diffusion and is then plated, so that the cell can be soldered directly to a heat sink. Progress is reported in detail.

BIOMASS PRODUCTION AND CONVERSION

REFER ALSO TO CITATION(S) 31527, 31728, 32418

31829 (CONF-800141—1) **Screening Prosopis (mesquite) germplasm for biomass production and nitrogen fixation.** Felker, P.; Cannell, G.H.; Clark, P.R.; Osborn, J.F. (California Univ., Riverside (USA). Dept. of Soil and Environmental Sciences). Jan 1980. Contract FG01-78ET20023. 23p. NTIS, PC A02/MF A01.

From International congress for study of semi-arid and arid zones; La Serena, Chile (Jan 1980).

The nitrogen-fixing trees of the genus Prosopis (mesquite or algaroba) are well adapted to the semi-arid and often saline regions of the world. These trees may produce firewood or pods for livestock food, they may stabilize sand dunes and they may enrich the soil by production of leaf litter supported by nitrogen fixation. A collection of nearly 500 Prosopis accessions representing North and South American and African germplasm has been established. Seventy of these accessions representing 14 taxa are being grown under field conditions where a 30-fold range in biomass productivity among accessions has been estimated. In a greehouse experiment, 13 Prosopis taxa grew on nitrogen-free medium nodulated, and had a 10-fold difference in nitrogen fixation (acetylene reduction). When Prosopis is propagated by seed the resulting trees are extremely variable in growth rate and presence or absence of thorns. Propagation of 6 Prosopis taxa by stem cuttings has been achieved with low success (1 to 10%) in field-grown plants and with higher success (50 to 100%) with young actively growing greenhouse plants.

31830 (CONF-800334—19) **Environmental assessment of stillage control.** Barney, W.K.; Chang, H. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 12p. NTIS, PC A02/MF A01.

From 2. DOE environmental control symposium; Reston, VA, USA (17 Mar 1980).

The US government is encouraging increased production and use of gasohol in an effort to make the United States more energy independent. The current national goal is to substitute gasohol for 10% of the unleaded gasoline consumed in the United States by th end of 1980. Increased production of fuel ethanol in the years to come seems certain. In producing fuel ethanol (200 proof) from biomass feedstocks by fermentation, a liquid residue called stillage is produced. The concentration of BOD_5 in stillage is usually high compared to that in domestic waste, and this residue must go through a waste treatment process before discharge into bodies of water. While stillage has potential uses as an animal feed, soil amendment, and protein source for humans, the liquid remaining after useful stillage components have been extracted must still be treated before discharge to the environment. This paper identifies the types of stillage that are produced as well as their control. The concept of stillage control in the context of this paper includes both the uses and environmental control technology needs of stillage.

31831 (CONF-800761—1) **Technical paper on energy farming of desert species.** Felker, P. (California Univ., Riverside (USA). Dept. of Soil and Environmental Sciences). 1980. Contract FG01-78ET20023. 9p. NTIS, PC A02/MF A01.

From Energy farms workshop of California Energy Commission; Sacramento, CA, USA (14 Jul 1980).

Properties of five desert tree legumes are tabulated. Potential resource areas are classified into 4 major areas by water supply and discussed in order of increasing resource potential. Conclusions and recommendations are presented. (MHR)

31832 (CONF-800840—1) **Arid land plants: promising new tools for economic development and basic research.** Felker, P. (California Univ., Riverside (USA). Dept. of Soil and Environmental Sciences). 1980. Contract FG01-78ET20023. 23p. NTIS, PC A02/MF A01.

From Symposium on the economic development of desert plants; Tucson, AZ, USA (4 Aug 1980).

An overview is presented of arid land plant development stressing products and plant physiological and ecological concepts unique to arid land plants. Integration of new arid land crops into polyculture management systems is suggested utilizing specialized plant functions, e.g., drought resistance, resistance to salinity, ability to fix nitrogen, frost tolerance and capability to produce a cash crop. Impacts on arid land plant productivity on political systems of developing countries are discussed and recommendations are presented for overcoming institutional constraints facing arid land plant development. (MHR)

31833 (COO—2917-16) **Biological conversion of biomass to methane. Final report, June 1, 1976-January 31, 1980.** Pfeffer, J.T. (Illinois Univ., Urbana (USA). Dept. of Civil Engineering). Feb 1980. Contract EY-76-S-02-2917. 143p. NTIS, PC A07/MF A01.

An experimental methane fermentation system was constructed for the purpose of evaluating the processng requirements and conversion efficiencies associated with production of methane from various organic feed stocks. The fermentation reactors had an operating volume 0.775 m^3. This permitted operation with an approximate continuous feed of milled organics including beef feedlot manure, corn stover, wheat straw and alfalfa hay. A thermochemical pretreatment was applied to the corn stover and wheat straw in order to increase the biodegradability of these substrates. Working with these large units provided sufficient volumes of fermented slurry for evaluation of the dewatering properties of these slurries. Kinetic data were obtained by operating four reactors at different retention times. These data were used to calculate a first order rate constant and the percent of substrate volatile solids that were biodegradable. These data were obtained on beef feed lot manure at 40°C and 60°C nominal fermentation temperatures. Data from the fermentation of corn stover showed that the biodegradability of the stover volatile solids was only 36 percent at the thermophilic fermentation temperature. The first order rate constant was found to be 0.25 day^{-1}. Thermochemical pretreatment increased the biodegradability of stover volatile solids to 71 percent. The final substrate tested was a green crop that was field dried - alfalfa. Significant foaming problems were encountered with this material. The volatile solids were found to be 74 percent biodegradable at a fermentation temperature of 60°C. (MHR)

31834 (COO—4070-11) **Biological production of liquid fuels from biomass. Annual report, September 1, 1978-August 31, 1979.** Pye, E.K.; Humphrey, A.E. (Pennsylvania Univ., Philadelphia (USA)). 1979. Contract EY-76-S-02-4070. 113p. NTIS, PC A06/MF A01.

The production of liquid fuels from renewable resources such as poplar wood and lignocellulosic wastes from a refuse hydropulper were studied. The particular scheme being studied involves the conversion of a cellulosic residue, resulting from a solvent delignified lignocellulosic feed, into either high concentration sugar syrups or into ethyl and/or butyl alcohol. The process is aimed at achieving total raw material utilization and maximization of high value by-product recovery. Specific goals of the investigation are the demonstration of the process technical feasibility and economic practicality and its optimization for maximum economic yield and efficiency. The construction of a pilot apparatus for solvent delignifying 150g samples of lignocellulosic feeds has been completed. Also, an analysis method for characterizing the delignified product has been selected and tested. Delignified samples are now being prepared and tested for their extent of delignification and susceptibility to enzyme hydrolysis.

31835 (DOE/ET/20002—T1) **Sugarcane spacing. II. Effects of spacing on the plant.** Irvine, J.E.; Benda, G.T.A. (Department of Agriculture, New Orleans, LA (USA)). 1980. Contract AI01-77ET20002. 19p. NTIS, PC A02/MF A01.

Intrarow spacing with 19 cm between plants on a 183-cm row produced significantly higher yields of biomass, net cane and sugar/ha when compared to intrarow spacings of 38 and 76 cm. Equidistant spacings of 19, 38, 76, and 152 cm produced significant differences in fiber % cane, stalk diameter, and leaf area index, as well as yields of biomass, net cane and sugar/ha. There was no significant effect on the sugar content of cane. Ten equidistant spacings ranging from 26.7 to 179.1 cm produced increases in plant population, biomass, net cane and sugar/ha with decreased spacing. Stalk diameter, shoot number, and plant weight decreased as interplant distance decreased. Varietal differences in yield of cane and sugar/ha were more pronounced with closer than with wider spacings. There was a significant correlation ($r = 0.71^*$) between performance of a variety on closer and wider spacings, indicating selections made on wide rows should perform adequately on closer rows.

31836 (DOE/ET/20076—T1) **Water and land availability for energy farming. Final report.** Schooley, F.A.; Mara, S.J.; Mendel, D.A.; Meagher, P.C.; So, E.C. (SRI International, Menlo Park, CA (USA)). Oct 1979. Contract AC01-78ET20076. 288p. NTIS, PC A13/MF A01.

The physical and economic availability of land and water resources for energy farming were determined. Ten water subbasins possessing favorable land and water availabilities were ranked according to their overall potential for biomass production. The study results clearly identify the Southeast as a favorable area for biomass farming. The Northwest and North-Central United States should also be considered on the basis of their highly favorable environmental characteristics. Both high and low estimates of water availability for 1985 and 2000 in each of 99 subbasins were prepared. Subbasins in which surface water consumption was more than 50% of surface water supply were eliminated from the land availability analysis, leaving 71 subbasins to be examined. The amount of acreage potentially available for biomass production in these subbasins was determined through a comparison of estimated average annual net returns developed for conventional agriculture and forestry with net returns for several biomass production options. In addition to a computerized method of ranking subbasins according to their overall potential for biomass production, a methodology for evaluating future energy farm locations was developed. This methodology included a general area selection procedure as well as specific site analysis recommendations. Thirty-five general factors and a five-step site-specific analysis procedure are described.

31837 **Simulating photosynthetic quantum conversion.** Calvin, M. (Univ. of California, Berkeley). *Acc. Chem. Res.;* **11**: 369-374(1978).

Efforts to set up a physical system in which the two quantum processes involved in photosynthesis are separated in space so that the oxygen-generating system will be in one place and the hydrogen, or reducing system in another place are described. Various systems which have been or might be used to simulate photosynthesis are described. These include a bilipid membrane into which two different sensitizing centers have been inserted, a spherical micellular material with electron sink o_2 source on one surface and sensitizer on the other surface, a crosslinked copolymer of styrene-butadiene-acrylic acid, and a semiconductor crystal which has a valence bond and a conduction bond for the sink and source. Each system is discussed briefly with discussion of results of experiments demonstrating directly the photoinduced electron transfer from porphyrin in a micelle to a quinone in aqueous solution by directly measuring the photoreduction of the quinone being included. (BLM)

31838 (DOE/TIC—11238) **Report of the Energy Research Advisory Board on gasohol.** (Department of Energy, Washington, DC (USA)). 29 Apr 1980. 37p. NTIS, PC A03/MF A01.

The principal conclusions of the Study Group are as follows: (1) Ethanol production as a near-term (mid-1980's) partial solution to the liquid fuels problem (based on current incentives) will probably reach 200 to 300 million gallons per year by 1985. Thereafter, about 800 million gallons of ethanol could be produced per year. This level of ethanol production would displace an equivalent of 26,000 barrels of oil per day or less than one percent of US gasoline consumption; and (2) utilizing the best available technology before 1985 the net energy balance is about zero for ethanol produced from corn and other crops in fermentation/distillation plants. If the fermentation/distillation plants are fueled by coal or wood, each gallon of ethanol produced could save roughly 0.5 gallons of oil.

31839 (DOE/TIC—11242) **Carbohydrate crops as sources of fuels.** Lipinsky, E.S. (Battelle Columbus Labs., OH (USA)). 1 Apr 1978. Contract W-7405-ENG-92-077. 8p. NTIS, PC A02/MF A01.

Evaluation of yields and costs of sweet sorghum and sugarcane production using narrow interrow spacing yielded favorable results leading to a tentative go decision for development of sweet sorghum as an energy crop. Sugarcane's limited geographical range relegates it to a secondary position for now. Experimental production of sweet sorghum is being expanded into North Dakota (long day length and short growing season) and into Kansas and Nebraska drylands. Farm Bureau trials in Illinois, Iowa, and Ohio will test farmer acceptance. Grain sorghum-sweet sorghum hybrids to stretch the fermentation season are being evaluated. The benefits of narrow interrow spacing necessitate the development of integrated planting, harvesting, processing, storage, and conversion systems. Developments outside the scope of this paper are underway in these areas.

31840 (DSE—3002-T1(Vol.1)) **Technical-economic assessment of the production of methanol from biomass. Executive summary. Final research report.** Wan, E.I.; Simmons, J.A.; Price, J.D.; Nguyen, T.D.

(Science Applications, Inc., McLean, VA (USA)). 12 Jul 1979. Contract ET-78-C-01-3002. 27p. NTIS, PC A02/MF A01.

The results are presented of a comprehensive systems study which assessed the engineering and economic feasibilities of the production of methanol from biomass utilizing existing technology. The three major components of the biomass to methanol system assessed are the availability of biomass feedstocks, the thermochemical conversion of biomass to methanol fuels, and the distribution and markets for methanol fuels. The results of this study show that methanol fuel can be produced from biomass using commercially available technology in the near term, and could be produced economically in significant quantities in the mid-to-late 1980's when advanced technology is available.

31841 (DSE—3002-T1(Vol.2)) **Technical-economic assessment of the production of methanol from biomass. Assessment of biomass resource and methanol market. Final research report.** Wan, E.I.; Simmons, J.A.; Price, J.D.; Nguyen, T.D. (Science Applications, Inc., McLean, VA (USA)). 12 Jul 1979. Contract ET-78-C-01-3002. 70p. NTIS, PC A04/MF A01.

Detailed information is presented on the following: feasibility of biomass feedstocks for methanol production, biomass availability and costs, potential demand for methanol from biomass, comparison of potential methanol demand and supply, and market penetration assessment. (MHR)

31842 (DSE—3002-T1(Vol.3)) **Technical-economic assessment of the production of methanol from biomass. Conversion process analysis. Final research report.** Wan, E.I.; Simmons, J.A.; Price, J.D.; Nguyen, T.D. (Science Applications, Inc., McLean, VA (USA)). 12 Jul 1979. Contract ET-78-C-01-3002. 353p. NTIS, PC A16/MF A01.

A comprehensive engineering system study was conducted to assess various thermochemical processes suitable for converting biomass to methanol. A summary of the conversion process study results is presented here, delineating the technical and economic feasibilities of producing methanol fuel from biomass utilizing the currently available technologies. (MHR)

31843 (NYSERDA—79-7) **Estimates of the costs of renewable energy technologies for New York State.** Funkhouser, D. (Urban Systems Research and Engineering, Inc., Cambridge, MA (USA)). Jul 1979. 485p. New York State Energy Research and Development Authority, Albany, NY.

The findings of Urban Systems Research and Engineering on the costs of renewable energy technologies in New York state are summarized. The input will be used by the First New York State Energy Master Plan and will assist the State Energy Office in determining the appropriate role and likely level of market penetration for renewable energy technologies through 1995. The costs associated with individual renewable energy technologies are identified and life cycle costs are presented for most renewable energy technologies. Technologies discussed are: solar active space and water heating for residential and commercial users; solar active heat generation for industrial process heat; solar passive space heating; solar photovoltaics energy conversion; resource recovery; small hydroelectric generation; wood and other biomass energy; wind; and geothermal energy.

31844 (P—500-80-017) **Potential of energy farming in the southeastern California desert.** Lew, V. (California Energy Commission, Sacramento (USA)). Apr 1980. 60p. California Energy Commission, Sacramento.

The California Energy Commission is currently analyzing the use of energy farms to provide future sources of energy for California. Energy farms can be defined as growing plants and converting them to various forms of energy. The use of marginal desert lands in southeastern California for the siting of energy farms using acacia, Eucalyptus, euphorbia, quayule, jojoba, mesquite, or tamarisk is considered. Two hypothetical scenarios using either rainfall, or rainfall and groundwater as water sources were described to determine the maximum amount of energy produced from estimated amounts of suitable land in this area. Considering both scenarios, the maximum range of energy produced is .03 to 0.4 Quads. It is recommended that (1) genetic research be continued to increase biomass yields of these and other candidate plants grown in the desert; and (2) small test plots be established at varying desert locations to collect yield growth, and survival data. Once this information is known, the identification of the best plant(s) to use for energy farming in the California desert area will be known, as well as the cost and quantity of energy produced.

31845 (SERI/TP—332-599) **Biomass gasification: yesterday, today, and tomorrow.** Reed, T.B. (Solar Energy Research Inst., Golden, CO (USA)). Mar 1980. Contract AC02-77CH00178. 9p. (CONF-800246—1). NTIS, PC A02/MF A01.

From Forest Products Research Society: Energy from forest products; Atlanta, GA, USA (Feb 1980).

The solid fuels, biomass and coal, can be converted by gasification into clean gaseous fuels that are easier to distribute and required for many technical processes. The simplest method of conversion is air gasification, producing a low-energy gas well suited for direct-heat or engine applications but unsuitable for pipeline use. Oxygen gasification produces a medium-energy gas composed primarily of CO and H_2, which can be used industrial pipelines for operation of turbines for power and heat cogeneration or for chemical synthesis of methanol or ammonia. Steam or hydrogen gasification are also possible but external heat and energy sources are required. Slow pyrolysis produces a medium-energy gas, charcoal, and oil. Gases resulting from fast pyrolysis contain a high concentration of olefins (primarily ethylene), which are quite useful for synthesis of fuels or chemicals. This paper presents some of the most pertinent material from the three-volume SERI report, A Survey of Biomass Gasification.

31846 (SERI/TR—98340-1) **Feeding value of dried distillers' grains (DDG) in beef feedlot rations. Final report.** Ward, G.M.; Matsushima, J.K. (Solar Energy Research Inst., Golden, CO (USA)). Jun 1980. Contract AC02-77CH00178. 17p. NTIS, PC A02/MF A01.

Dried distillers' grains (DDG) replaced flaked corn in the feed for steers in the Colorado State University feedlot at rates of 0%, 15%, and 30% of finishing rations. Steers were randomly assigned to six pen treatments with each treatment replicated. No significant differences in weight gains, feed efficiency, or general health were observed between treatments. Likewise, differences in carcass quality were negligible. Under the conditions of this experiment ad prevailing prices, DDG was worth $113/ton. If its full value as a protein supplement had been credited, it would have had a value of $131/ton. This compares to the market price at the time of $150/ton for DDG.

31847 **Biological energy conversion: the photosynthetic process.** Ward, R.L. (Lawrence Livermore Lab., CA). pp 563-588 of Solar energy technology handbook. Part A. Engineering fundamentals. Dickinson, W.C.; Cheremisinoff, P.N. (eds.). New York, NY; Marcel Dekker, Inc. (1980).

The following topics in photosynthesis are reviewed; light-harvesting pigments, plant pigments and reaction centers, chemical aspects, environmental effects on photosynthesis, and efficiency of photosynthesis. (MHR)

31848 **Energy farming.** Hodam, R.; Lew, V. (California Energy Commission, Sacramento). pp 589-614 of Solar energy technology handbook. Part A. Engineering fundamentals. Dickinson, W.C.; Cheremisinoff, P.N. (eds.). New York, NY; Marcel Dekker, Inc. (1980).

The proposed plants and economics of energy farming are reviewed. Individual plants considered which are described in some detail are: sorghums and sudangrass, kenaf, sugar cane, sunflower, eucalyptus, euphorbia and guayule, American sycamore, loblolly pine, Populus species, red alder, water hyacynths, microalgae, and kelp. (MHR)

31849 **University of Kansas energy forest. Final report to the Ozarks Regional Commission.** Manhattan, KS; Kansas State Univ. (1980). 78p. (NP—25044).

The results are summarized of a four year study into the feasibility of using wood fuels to carry the peak load requirements of a proposed new central steam facility at the University of Kansas campus in Lawrence. The presumed primary fuel for this new plant is municipal solid waste. The major conclusion of this study is that the addition of a separately fired wood burning system capable of being used during the annual natural gas cutoff period (mid-winter) is technically and economically feasible. At the least it would eliminate the necessity of switching the existing facility to high cost fuel oil. Realistically it could also be operated in tandem with the natural gas unit, assuming part of the steam generating load on a regular basis, thus reducing the total demand for the natural gas and cutting total fuel costs. Plantation grown fuelwood may still be too expensive to be the sole source of wood fuel. However, this assumption is based upon only 4 years of data projected to an 8 year production cycle. (MHR)

31850 **Wood Waste/Agricultural Residue Task Force.** Salem, OR; Oregon State Department of Energy (1980). 79p. (NP—25046).

The work of the Alternate Energy Development Commission's Task Force on Wood, Agriculture Residues, and Solid Waste is summarized. Because energy plantations will not contribute significantly to Oregon's energy supply for the next ten to fifteen years, the Task Force did not include plantations in their estimate of the potential. The remaining resources can be considered residues. Annually available biomass resources included are collectible residues not likely to be used for building materials or fiber. Because product uses for the biomass resources are expanding, flow control for solid waste and the availability of a long-term supply for crop and wood residues are considerations paramount to any capital investment in energy use of biomass. Uses which require large quantities of fuel will be concentrated in industries which can

control their fuel supply as a production function. For example, the forest products industry will remain the major users of wood fuel. With higher prices for oil and gas, however, many new and smaller users will be able to economically use local biomass resources.

31851 Vascular plants for water pollution control and renewable sources of energy. Wolverton, B.C.; McDonald, R.C. NSTL Station, MS; National Space Technology Labs. (1980). 13p. (CONF-800482—4).

From Bio-energy world congress and exposition; Atlanta, GA, USA (21 Apr 1980).

Vascular aquatic plants have demonstrated their ability to remove pollutants from domestic and chemical wastewaters. Plants such as the water hyacinth (Eichhornia crassipes), duckweed (Lemna sp., Spirodela sp., and Wolffia sp.), and cattail (Typha sp.) thrive in nutrient-rich waters and produce tremendous quantities of biomass under favorable climatic conditions. This method of wastewater treatment is currently being used exclusively at NASA's National Space Technology Laboratories (NSTL) with water hyacinths and duckweed to treat daily over 759 m^3 of domestic wastewater and 114 m^3 of chemical wastewater in four separate systems. The harvested plants from these systems have been used in various biomass utilization projects over the past five years. In laboratory batch studies of digesting vascular plants with anaerobic filters, NASA has found that 140 to 280 liters methane per kg dry weight can be obtained in an average of 23 days. Current NASA projects at NSTL seek to expand the technology required to design energy systems which produce methane through bioconversion with anaerobic filters and use the mineral residue as a nutrient source for producing new biomass.

31852 Cattails as an energy source. Pratt, D.C.; Andrews, N.J. St.Paul, MN; Univ. of Minnesota (1979). 22p. (CONF-800142—1).

From Institute of gas technology symposium; Orlando, FL, USA (Jan 1980).

Recent research at the Universty of Minnesota has demonstrated that cattail (Typha spp.) is a promising candidate for wetland biomass production; it grows naturally in monocultures, is highly productive, has few insect pests and can be grown on marginal lands. Biomass yields from natural stands often exceed 40 tons/kectare (1) while yields from plants grown in managed paddies on organic soils range from 25 to 30 tons/hectare/year. The efficiency of cattail as a solar energy collector is due to its canopy architecture, perennial habit, temperature tolerance and the fact that it normally is not limited by the availability of H_2O. Current work focuses on the feasibility of establishing extensive stands of cattail on Minnesota peatlands. Economic considerations and environmental constraints are discussed.

PHOTOCHEMICAL AND THERMOCHEMICAL CONVERSION

31853 (CONF-790541—63) **Light-dependent hydrogen production by C. reinhardi.** Lien, S.; McBride, C. (Solar Energy Research Inst., Golden, CO (USA); Indiana Univ., Bloomington (USA). Dept. of Biology). 1979. Contract AC02-77CH00178. 9p. NTIS, PC A02/MF A01.

From International Solar Energy Society meeting; Atlanta, GA, USA (28 May 1979).

The activity of hydrogenase in non-synchronous, photoheterotrophically grown cells of C. reinhardi is a function of culture age. Rapidly growing cultures (exponential phase) exhibit lower hydrogenase activity than early stationary phase cultures. During prolonged dark anearobic incubation the hydrogenase activity attains a maximal value in two to five hours. The activity declines rapidly after three to four hours of anaerobic incubation unless the pH of the suspending medium is maintained above 6.0. In C. reinhardi (strain 137 c) the source of electrons for hydrogen photoproduction appears to be derived mainly from water oxidation. However, when the water-splitting complex of photosystem II is impaired by a mutational block, the organism can utilize intracellular organic reductants as substrate for H_2 production in a light-dependent reaction involving both PSII and PS1. When photosynthetic electron transport is uncoupled from phosphorylation, a rate of 174 μmoles of hydrogen evolved per mg chl per hour is observed. This rate of hydrogen photoproduction corresponds to 76% of the reductant generating capacity of PSII under steady-state photosynthesis.

31854 (COO—4705-34) **Solar thermal hydrogen production process. Annual technical progress report, January-December, 1979.** Parker, G.H. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Energy Systems Div.). 1979. Contract ET-78-C-02-4705. 217p. NTIS, PC A10/MF A01.

Westinghouse is currently under contract to DOE for technology development of the Sulfur Cycle, a hybrid thermochemical-electrochemical process for the production of hydrogen and oxygen from water. Operational studies have been conducted and have resulted in definitions of operating modes for solar/hydrogen plants and in assessments of the day/night and annual variations in performance that will influence the operating modes and the sizing of plant subsystems. Conceptual design studies have been conducted for process components that interface with the solar receiver. From related trade-off studies, a preferred configuration emerged that involves an intermediate working fluid (e.g., hot gas) between the solar receiver and the sulfuric acid decomposition reactor. The design of the reactor has been based on a shell and tube type heat exchanger configuration with catalyst placement on the shell side. A number of candidate materials for structural use in the acid decomposition reactor also have been evaluated experimentally. Screening tests and endurance tests with potential catalysts (to accelerate the rate of sulfur trioxide cracking) have been conducted with encouraging results. Approximately three dozen candidate materials for use in constructing the acid vaporizer have been tested for corrosion resistance to the expected environment. Detailed discussions of the results obtained during 1979 are presented.

31855 (DOE/R5/10114—1) **Solar cell utilizing photochemical generation of electricity. Final research report.** Stevenson, K.L. (Purdue Univ., Fort Wayne, IN (USA). Dept. of Chemistry). 1979. Contract FG02-79R510114. 15p. NTIS, PC A02/MF A01.

The performance and parameter optimization of iodine photogalvanic cells were studied. The effects of solute and solvent, solvent concentration, electrode resistance and material, wavelength dependence, distance between electrodes, and temperature on cell performance were examined experimentally. Results are presented and discussed. (WHK)

31856 (DSE—4042-T24) **Development of electrochemical photovoltaic cells. Third technical progress report, November 1, 1979-January 31, 1980.** Byker, H.J.; Schwerzel, R.E.; Wood, V.E.; Austin, A.E.; Brooman, E.W. (Battelle Columbus Labs., OH (USA)). 7 Mar 1980. Contract EG-77-C-01-4042. 23p. NTIS, PC A02/MF A01.

The development of stable, efficient, electrochemical photovoltaic cells based on silicon and gallium arsenide in non-aqueous electrolyte systems is being investigated. The effect of surface condition of silicon electrodes on electrochemical and physical characteristics has been studied. An electrode-supporting electrolyte interaction in acetonitrile has been identified which leads to etching of the surface. Improved performance can result, which has practical significance. Gallium arsenide electrodes have been electrochemically characterized in cells containing propylene carbonate with a ferrocene/ferricenium redox additive. Degradation of the ferricenium salt under illumination has been investigated. Other redox couples studied to date have not given promising results. Long-term stability experiments have been deferred while a better understanding of electrode behavior is being obtained.

31857 (DSE—4042-T26) **Electrochemical photovoltaic cells. Project 65021 quarterly technical progress report, October 15, 1979-January 15, 1980.** Ang, P.G.P.; Remick, R.J.; Sammells, A.F. (Institute of Gas Technology, Chicago, IL (USA)). Mar 1980. Contract EG-77-C-01-4042. 39p. NTIS, PC A03/MF A01.

During the third quarter of this program, liquid junction devices based upon the semiconductors $MoSe_2$, MoS_2, GaAs, and CdSe have been evaluated. Lifetime testing of $MoSe_2$ and MoS_2 materials in acidic halogen electrolytes at constant current densities of 5 mA/cm^2 have shown excellent stability to date. For $MoSe_2$ single crystals in the electrolyte 1M HBr + 1M Br_2, short-circuit currents of 63 mA/cm^2 were achieved with a power conversion efficiency of 6.7% for 200 mW/cm^2 xenon light illumination. Transient potentiostatic measurements made on $MoSe_2$ in this electrolyte indicated little diffusion control, with exchange currents being of the order of 1 to 10 mA/cm^2. Good photoresponse of MoS_2 has been observed in 1M HBr + 1M Br_2. The performance of the natural crystal is comparable to the performance of a single-crystal MoS_2 in this electrolyte. CdSe thermally evaporated onto porous titanium gave efficiencies of about 4% with 100 mW/cm^2 xenon illumination. Experimental work was initiated on the dye sensitization of Fe_2O_3 and TiO_2 materials. Of the twelve dyes evaluated, little enhancement of the photoresponse of these materials was noted. Solid-state photoelectrochemical cells have been fabricated, based upon LiI. Cells of the configuration - cond. glass CdSe/LiI + PbI_2/LiI/LiI + C + PbI_2/cond. glass - were fabricated. Photoresponses up to 150 mV were observed.

31858 (LBL—11168) **Synthetic chloroplasts.** Calvin, M. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Jun 1980. Contract W-7405-ENG-48. 48p. (CONF-800905—2). NTIS, PC A03/MF A01.

From Photoelectrochemistry conference; Oxford, UK (8 Sep 1980).

The principal function of the chloroplast is to capture solar quanta and to store them in some stable form. We are in the process of trying to construct a totally synthetic system that would simulate some of the reactions of the two photosystems which occur in natural chloroplasts. Toward this end, we have demonstrated a number of the reactions required in separated systems. We have shown that it is possible to transfer electrons across an insulating

membrane barrier with a surfactant photosensitizer. Others have shown, and we have confirmed, that it is possible to collect the two electrons necessary for the generation of molecular hydrogen on a heterogeneous catalyst suspended in water and similarly to collect the four holes on another heterogeneous catalyst suspended in water for the generation of molecular oxygen. A synthesis of some of these molecular catalysts for both these purposes is underway, with some partial success. When these partial reactions are assembled in a system, the resulting synthetic chloroplasts will not resemble the natural entity in detailed construction as they will contain no protein.

31859 (SERI/PR—8802-9-T1) **Novel concepts in electrochemical solar cells. First quarterly progress report, May 15-July 15, 1979.** DuBow, J. (Colorado State Univ., Fort Collins (USA). Dept. of Electrical Engineering). 1979. Contract AC02-77CH00178. 15p. NTIS, PC A02/MF A01.

Emphasis has been directed toward the development and evaluation of an efficient, operational photoelectrochemical cell (PEC) system involving (i) molten salt (and/or highly concentrated, inorganic, non-aqueous) electrolytes, and (ii) the promising semiconductor electrode materials such as $CuTnS_2$, $CuInSe_2$, MoS_2, $MoSe^2$ etc. As a direct consequence, the stages of the work program that are most critical at this time are the electrode fabrication and characterization and the electrolyte preparation and characterization phases. It has been demonstrated for the first time that a semiconductor electrode exhibits quite large photoeffects in a cell containing a molten salt electrolyte. Detailed studies are underway to explore the constraints and advantages of this type of electrolyte, from the standpoint of efficiency, corrosion of the electrode, and the chemical and physical properties related to overall cell performance. Progress is reported. (WHK)

31860 (SERI/PR—8802-9-T2) **Novel concepts in electrochemical solar cells. Second quarterly progress report, August 15, 1979-October 15, 1979.** DuBow, J.; Job, R.; Krishnan, R.; Gale, B. (Colorado State Univ., Fort Collins (USA)). 1979. Contract AC02-77CH00178. 36p. NTIS, PC A03/MF A01.

It is considered that the short term stability of n-GaAs PEC's in a ferrocene-based, ambient temperature molten salt electrolyte is reasonably good. However, longer term evaluation is required to determine the extent and significance of corrosion, stability, etc. Extremely few fundamental studies have been made of the semiconductor/molten salt interphase and experiments in this area would be most useful. Indeed, even the design parameters for PECs of any kind have not been quantitatively delineated and present consideration will be given to models for PEC solar cells and limitations caused by ion transport in the electrolyte. The $MoSe_2$ and MoS_2 electrodes appear to have substrate reproducibility and transport limitations that make them unsuitable candidates for efficient PEC's at this time. Similarly, the lack of availability of high quality $CuInSe_2$ and $CuInS_2$ substrates limits the quantitative experimental evaluation of their utility for PEC applications. We are presently focusing attention on CdSe/CdTe mixtures and CdS as electrodes as well as Si and GaAs in molten salt and polyelectrolyte solutions. The system for solar cell evaluation and network analysis of substrates and cells was mode operational. Preliminary work on economic and theoretical modelling was begun. Progress is reported. (WHK)

31861 (SERI/PR—8802-9-T3) **Novel concepts in electrochemical solar cells. Third quarterly progress report, November 15, 1979-January 15, 1980.** DuBow, J.; Job, R.; Krishnan, R. (Colorado State Univ., Fort Collins (USA)). 1980. Contract AC02-77CH00178. 32p. NTIS, PC A03/MF A01.

Efforts have been primarily directed toward evaluation of the room temperature molten salt electrolyte in terms of its overall performance for photovoltaic cells. Mass transport processes may prove to be the rate-limiting factor for such electrolytes, unless the concentration of the photo-active redox component can be increased and the solvent viscosity reduced. Acid-base surface chemistry of n-GaAs as occurs in aqueous systems, has been found present and its consequences will be further explored. The selection and optimization of PEC electrolytes is a complex task and we believe that a systems approach would facilitate in identifying the basic electrolyte properties needed. A preliminary analysis reveals that although some of the criteria for an electrolyte are definable precisely, others do require empirical experimentation. It can be concluded that relatively few electrolytes in current use are adequate and it would appear that greater efforts to develop electrolytes would be advantageous. The various types of electrolytes that could be used for PEC's have been identified. Good quality $MoSe_2$ single crystals can be grown and short circuit currents greater than previously reported have been achieved in an $I_2/I^-/Pt$ cell. A novel technique to produce photo-active films by anodization is being investigated, initially for the formation of polycrystalline $MoSe_2$ layers.

31862 (SERI/PR—8802-9-T4) **Fourth quarterly progress report, January 15, 1980-May 15, 1980.** (Colorado State Univ., Fort Collins (USA)). 1980. Contract AC02-77CH00178. 5p. NTIS, PC A02/MF A01.

Research on surface charge and specific ion adsorption/acid-base effects at the n-GaAs/room temperature molten salt interphase and further evaluation of potential redox systems for photoelectrochemical cells is briefly described. (WHK)

PHOTOVOLTAIC POWER PLANTS

REFER ALSO TO CITATION(S) 31919, 32429

31863 (SAND—78-7040/2) **Regional conceptual design and analysis studies for residential photovoltaic systems.** Pittman, P.F.; Federmann, E.F. (Westinghouse Research and Development Center, Pittsburgh, PA (USA)). May 1980. Contract AC04-76DP00789. 269p. NTIS, PC A12/MF A01.

Solar residential photovoltaic energy systems suitable for incorporation into single-family residences were studied. The country was subdivided into ten regions, and the three best systems for each region were determined from the many possible system configurations, based on assumed subsystem costs and performance. Cost projections based on high volume production indicate that solar total energy systems would be viable. If a sufficiently comprehensive government program is forthcoming, they can be economicaly advantageous in some areas within 10 years and almost everywhere in the country by 2000. The three best system configurations found independent of the specific sites are those with combined electrical/thermal modules, electrical-only modules with a heat pump, and possibly separate side-by-side electrical and thermal arrays. Order of preference is determined by the site/structure characteristics.

31864 (SAND—79-2259) **Mechanical energy storage for photovoltaic/wind project. Final report.** Caskey, B.C.; Schildknecht, H.E. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1980. Contract AC04-76DP00789. 66p. NTIS, PC A04/MF A01.

This report describes the Solar Mechanical Energy Storage Program at the time that Lawrence Livermore Laboratory assumed the responsibility for it. It also presents contractor and system analyses results for residential flywheel energy-storage systems (FESS). Various phases of the program have addressed small-to-intermediate applications of photovoltaic/wind-energy storage using flywheels, compressed air, and low-head, underground pumped-hydro technologies. Sandia National Laboratories' recommendations for continued work in specific areas are included.

31865 (SAND—80-7069) **Summary of system designs for photovoltaic experiments and recommendations for future activities.** Fling, R.B.; Siegel, B. (Aerospace Corp., Los Angeles, CA (USA). Energy and Resources Div.). Jul 1980. Contract AC04-76DP00789. 56p. NTIS, PC A04/MF A01.

A review and summary of photovoltaic experiments designed by 29 industry/user teams for applications in the Intermediate Load Center sector, i.e., commercial, institutional, and industrial loads are presented. System sizes of 20 to 500 kW peak were considered. The 29 designs were comprised of 12 flat panel and 17 concentrator configurations. The design effort took place between June 1978 and February 1979 and was directed by the DOE Albuquerque Operations Office and the Sandia Laboratories. The 9 designs covered a wide range of applications, including office buildings, industrial plants, airports, schools, amusement parks, utility substations, institutional facilities, and remote stand-alone loads. The concentrator types included parabolic troughs, linear Fresnel, circular Fresnel, and cassegrain designs with geometric concentration ratios ranging from 20 to 400. One project selected gallium arsenide as a cell material and all but one of the remaining designs used single crystal silicon cells. Nine of the projects subsequently have been selected for construction and evaluation. Recommendations are made for additional experiments or analyses including desalinization of water by electrodialysis, dc-powered telephone switching, agricultural water pumping, industrial applications, high concentration (> 200X) collectors, flat panel tracking, and cell/module failure detection concepts.

SOLAR THERMAL POWER PLANTS

REFER ALSO TO CITATION(S) 32061

31866 (ALO—44) **Feasibility study of the Solar King, Inc. machine concept.** (Baylor Univ., Waco, TX (USA). Baylor Inst. of Environmental Studies; American Solar King Corp., Waco, TX). 25 Mar 1977. Contract AC04-76ET20250. 78p. NTIS, PC A05/MF A01.

A conceptual engine driven by water from solar heated flat plate collectors has been operated (patent No. 640017) by Solar

King, Inc., and the Institute of Environmental Studies of Baylor University. Development of a thermodynamic model of the operation of the engine has been completed. In addition, laboratory tests concerning the performance of the major components have also been conducted. The results of the comparison between analytical studies using the thermodynamic model and data obtained from the laboratory experiments is presented. Excellent agreement is found between the analytical and laboratory investigations. Applications of these results and suggestions for continuation of present work are discussed.

CENTRAL RECEIVER

31867 (SAND—79-2154C) **Solar central receiver in perspective.** Dellin, T.A. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 10p. (CONF-800604—35). NTIS, PC A02/MF A01.

From American section of the International Solar Energy Society conference; Phoenix, AZ, USA (2 Jun 1980).

The variation in the energy costs of solar central receiver systems as a function of power level, receiver geometry, heliostat size, and heliostat canting option are presented. The results were obtained using a new version of the DELSOL computer model. A broad minimum in the cost of thermal energy at the base of the tower is observed in systems with power levels from 10 MW/sub t/ to over 1000 MW/sub t/. In addition, this power range can be served by a single heliostat design.

31868 **Solar receiver heliostat reflector having a linear drive and position information system.** Horton, R.H. (to Dept. of Energy). US Patent 4,192,583. 11 Mar 1980. Filed date 21 Oct 1977. 10p.

PAT-APPL-844,403.

A heliostat for a solar receiver system comprises an improved drive and control system for the heliostat reflector assembly. The heliostat reflector assembly is controllably driven in a predetermined way by a light-weight drive system so as to be angularly adjustable in both elevation and azimuth to track the sun and efficiently continuously reflect the sun's rays to a focal zone, i.e., heat receiver, which forms part of a solar energy utilization system, such as a solar energy fueled electrical power generation system. The improved drive system includes linear stepping motors which comprise low weight, low cost, electronic pulse driven components. One embodiment comprises linear stepping motors controlled by a programmed, electronic microprocessor. Another embodiment comprises a tape driven system controlled by a position control magnetic tape.

TOTAL ENERGY AND HYBRID SYSTEMS

31869 (DOE/ET/21038—1(Vol.2)) **Solar central receiver hybrid power system, Phase I. Volume 2. Conceptual design. Final technical report, October 1978-August 1979.** (Martin Marietta Corp., Denver, CO (USA)). Sep 1979. Contract ET-78-C-03-2234. 511p. NTIS, PC A22/MF A01.

The objectives of this study were to develop a hybrid power system design that (1) produces minimum cost electric power, (2) minimizes the capital investment and operating cost, (3) permits capacity displacement, (4) and achieves utility acceptance for market penetration. We have met the first three of these objectives and therefore believe that the fourth, utility acceptance, will become a reality. These objectives have been met by utilizing the Martin Marietta concept that combines the alternate central receiver power system design and a high-temperature salt primary heat transfer fluid and thermal storage media system with a fossil-fired nonsolar energy source. Task 1 reviewed the requirements definition document and comments and recommendations were provided to DOE/San Francisco. Task 2 consisted of a market analysis to evaluate the potential market of solar hybrid power plants. Twenty-two utilities were selected within nine regions of the country. Both written and verbal correspondence was used to assess solar hybrid power plants with respect to the utilities' future requirements and plans. The parametric analysis of Task 3 evaluated a wide range of subsystem configurations and sizes. These analyses included subsystems from the solar standalone alternate central receiver power system using high-temperature molten salt and from fossil fuel nonsolar subsystems. Task 4, selection of the preferred commerical system configuration, utilized the parametric analyses developed in Task 3 to select system and subsystem configurations for the commercial plant design. Task 5 developed a conceptual design of the selected commercial plant configuration and assessed the related cost and performance. Task 6 assessed the economics and performance of the selected configuration as well as future potential improvements or limitations of the hybrid power plants.

31870 (DOE/ET/21038—1(Vol.3)) **Solar central receiver hybrid power system, Phase I. Volume 3. Appendices. Final technical report, October 1978-August 1979.** (Martin Marietta Corp., Denver, CO (USA)). Sep 1979. Contract ET-78-C-03-2234. 253p. NTIS, PC A15/MF A01.

A design study for a central receiver/fossil fuel hybrid power system using molten salts for heat transfer and heat storage is presented. This volume contains the appendices: (A) parametric salt piping data; (B) sample heat exchanger calculations; (C) salt chemistry and salt/materials compatibility evaluation; (D) heliostat field coordinates; (E) data lists; (F) STEAEC program input data; (G) hybrid receiver design drawings; (H) hybrid receiver absorber tube thermal math model; (I) piping stress analysis; (J) 100-MWe 18-hour storage solar central receiver hybrid power system capital cost worksheets; and (K) 500-MWe 18-hour solar central receiver hybrid power system cost breakdown. (WHK)

31871 (ORNL/TM—7297) **Research on noneconomic factors relevant to the diffusion of Solar Total Energy Systems.** Berry, L.G.; Bronfman, L.M. (Oak Ridge National Lab., TN (USA)). Aug 1980. Contract W-7405-ENG-26. 78p. NTIS, PC A05/MF A01.

This report has two major purposes: (1) to review and evaluate the policy uses of some of the concepts and models found in diffusion-of-innovation literatures other than those of economics and marketing and (2) to apply the results of this review to the specific case of a Solar Total Energy System (STES). The research effort had three parts. The first part was to identify and obtain an overview of the noneconomics social science literatures relevant to the problem of forecasting and accelerating adoption rates. After the first part was completed and the principal research perspectives and researchers in the field had been identified, a workshop of experts was organized to address the problem of predicting and accelerating diffusion rates for STESs. Finally, the results of the literature review and the workshop were summarized, and a number of approaches suggested by the diffusion literature were used to obtain an evaluation of the adoption potential of STES. Major conclusions of the report are (1) diffusion models have a limited predictive value; (2) a number of general policy guidelines for programs aimed at increasing diffusion rates are provided by the literature; and (3) STES diffusion is likely to be rather slow unless substantial contextual changes or policy interventions take place.

OCEAN THERMAL GRADIENT POWER PLANTS

REFER ALSO TO CITATION(S) 32118

31872 (COO—4931-3) **400 MWe commercial OTEC plants: review of reports by Gibbs and Cox, Inc., Lockheed Missile and Space Corporation, M. Rosenblatt and Sons.** (McMullen (John J.) Associates, Inc., New York (USA)). Jun 1979. Contract ET-78-C-02-4931. 222p. NTIS, PC A10/MF A01.

The Department of Energy contracted with Gibbs and Cox, M. Rosenblatt and Son and Lockheed Missile and Space Corporation to prepare conceptual designs, cost estimates and analyses for a 400 MWe OTEC Commercial Size platform. Each contractor was directed to investigate two predetermined hull configurations and to relate them to one operating site, selected by DOE. A total of 6 designs, covering sphere, spar, ship and semisubmersibles were studied by the three contractors. The results of their investigations were presented by DOE in Washington on May 8, 1978. The presentations showed that whereas a considerable data base has been built, no clear conclusions had emerged with respect to the direction that future design of the commercial platform should take. JJMA has been directed by Value Engineering on behalf of DOE to review the conceptual designs and the accompanying data base prepared by the three contractors. The intent of this review is to propose to DOE the answers to the following questions, based on the results of studies by the three contractors: (1) If DOE were to build a 400 MW OTEC plant, starting now, what should they build. (2) What are the reasons for the decisions. (3) What would it cost. Results are detailed.

31873 (DOE/CH/00134—1) **Antifouling marine concrete.** Vind, H.P.; Mathews, C.W. (Naval Civil Engineering Lab., Port Hueneme, CA (USA)). Jul 1980. Contract AI02-77CH00134. 38p. NTIS, PC A03/MF A01.

Various toxic agents were evaluated as to their capability to prevent or inhibit the attachment of marine fouling organisms to concrete for OTEC plants. Creosote and bis-(tri-n-butyltin) oxide (TBTO) were impregnated into porous aggregate which was used in making concrete. Cuprous oxide, triphenyltin hydroxide (TPTH), and 2-2-bis-(p-methoxyphenyl)-1,1,1-trichloroethane (methoxychlor) were used as dry additives. Two proprietary formulations were applied as coatings on untreated concrete. Test specimens were exposed at Port Hueneme, CA, and Key Biscayne, FL. The efficacy of toxicants was determined by periodically weighing the adhering fouling organisms. Concrete prepared with an aggregate impregnated with a TBTO/creosote mixture has demonstrated the best antifouling performance of those specimens exposed for more than one year. The two proprietary coatings and the concrete containing methoxychlor, TPTH, and cuprous oxide as dry additives have exhibited good antifouling properties, but they have been exposed

for a shorter time. The strength of concrete containing the toxicants was acceptable, and the toxicants did not increase the corrosion rate of reinforcing rods. Organotin compounds were essentially unchanged in concrete specimens exposed 6-1/2 years in seawater.

31874 (LBL—9438) **Ocean Thermal Energy Conversion preliminary data report for the February 1978 GOTEC-03 cruise to the Gulf of Mexico, mobile site.** (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Jun 1980. Contract W-7405-ENG-48. 34p. NTIS, PC A03/MF A01.

Preliminary physical, chemical, and biological data obtained on the GOTEC-03 cruise in February 27 to March 3, 1978 to the Mobile Site near 29°N, 88°W are presented in tabular and graphic form. The physical and chemical data consists of salinities and dissolved oxygens derived from water samples and temperatures from XBT's. The biological data includes biomass indicators (chlorophyll a, phaeophytin, and adenosine triphosphate), and zooplankton samples. The XBT and other physical data including current data collected on the GOTEC-03 cruise are reported elsewhere in Molinari, Hazelworth, and Ortman (1979).

31875 (ORNL/Sub—7654/1) **Development of a Foam OTEC System. Final technical report for Fiscal Year 1979.** (Carnegie-Mellon Univ., Pittsburgh, PA (USA)). 1980. Contract W-7405-ENG-26. 272p. NTIS, PC A12/MF A01.

Research on Development of a Foam OTEC System, as carried out at Carnegie-Mellon University from October 1, 1978 through September 30, 1979, is described. To a brief section summarizing highlights of research results are appended 12 technical reports which detail specific sections of the program. The work described is continuing and a proposal is currently being submitted to provide support in fiscal 1980.

31876 (RAND/R—2595-E) **Quantitative evaluation of closed-cycle Ocean Thermal Energy Conversion (OTEC) technology in central station applications.** Gritton, E.C.; Pei, R.Y.; Aroesty, J.; Balaban, M.M.; Gazley, C.; Hess, R.W.; Krase, W.H. (RAND Corp., Santa Monica, CA (USA)). May 1980. Contract AC01-79PE70078. 139p. NTIS, PC A07/MF A01.

The results of an independent quantitative evaluation by Rand of Ocean Thermal Energy Conversion (OTEC) for central station applications are summarized. The methodology developed and implemented for the quantitative analysis of cost sensitivities and engineering uncertainties provides the Office of Energy Research (OER) with the capability for evaluating the effects of alternative OTEC R & D strategies. The analysis also provides a general quantitative approach to assess advanced energy technologies. This study focuses on closed-cycle OTEC for delivery of electric power to the United States. Performance and costs of complete commercial OTEC systems are analyzed at the system level using inputs from component analyses and thermal-resource data for sites in the Gulf of Mexico. Such sites could feed the Gulf Coast from the west coast of Florida to the New Orleans areas. In this evaluation, the energy conversion analysis, i.e., the study of the power system, is based on a thermodynamic analysis of the complete system, which includes allowances for losses in all circuits. A cost-minimization scheme is used to ensure that the cycle component choices are near optimal. To make these cost-minimization calculations, cost algorithms are developed for the principal components. Off-design operations are of great importance in the Gulf of Mexico because of significant seasonal surface temperature variations and the quite large resulting variations of output power. These effects are accounted for in this study by calculating the off-design performance of the power systems and by selecting the cycle that maximizes the average power over the year. Capital cost estimates are made for the complete system. (WHK)

31877 (SAN—0034-76-1) **Studies of the vertical mist transport process for an ocean thermal energy cycle. Final report.** Charwat, A.F. (California Univ., Los Angeles (USA). School of Engineering and Applied Science). Nov 1978. Contract EY-76-S-03-0034. 145p. (UCLA-ENG—7856). NTIS, PC A07/MF A01.

The Mist-Flow OTEC is discussed with emphasis on the identification of the processes comprizing it. The facility and preliminary experiments on the performance of system components are described. Detailed discussions of the critical components of the facility are given, and a summary of bibliographical research on the subject is included. A thorough review of literature and extensive design studies confirm the basic soundness of the mist-lift process for application to OTEC. Systematic experimentation is needed to establish the best range of reliable operation; as of the present, however, extrapolations of existing data allow one to establish confidence limits which are acceptable from the viewpoint of the overall cycle. The experimental facility, which consists of a 7 meter (23 ft) high, .9 meter diameter vertical mist-lift tube, was designed and built successfully. Several critical component problems were resolved, notably: (a) the feasibility of producing an adequate mist generator was demonstrated and, (b) a successful phase-separator at the condenser inlet was developed. Shake-down tests have been virtually completed. (WHK)

SOLAR RADIATION UTILIZATION

31878 **Shallow solar ponds.** Clark, A.F.; Dickinson, W.C. (Lawrence Livermore Lab., CA). pp 377-402 of Solar energy technology handbook. Part A. Engineering fundamentals. Dickinson, W.C.; Cheremisinoff, P.N. (eds.). New York, NY; Marcel Dekker, Inc. (1980).

After reviewing the history and background of the shallow solar ponds (SSP) concept, several design options for SSP are discussed. The theory of SSP performance is considered, and the performance of actual SSP's is presented in graphs and tables and compared with theory. Materials considerations for component parts of SSP's are discussed. Several applications of SSP systems for providing hot water and power conversion are considered. A brief economic analysis of a prototype facility is presented. (SPH)

SPACE HEATING AND COOLING

REFER ALSO TO CITATION(S) 31786, 31843, 32027, 32036, 32060

31879 (BNL—27962) **Compressor performance at high suction temperatures with application to solar heat pump.** Kush, E.A. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 9p. (CONF-800748—1). NTIS, PC A02/MF A01.

From Purdue compressor technology conference; West Lafayette, IN, USA (23 Jul 1980).

As part of the study of Solar Assisted Heat Pump (SAHP) Systems, the performance of the heat pump itself and its components under conditions attendant to series solar input to the evaporator is being investigated at Brookhaven National Laboratory (BNL). Particular emphasis has been placed on the details of the compressor performance, since in order to properly exploit the thermodynamic potential of high solar input temperatures (40 to 100°F), the compressor must operate efficiently over a wide range of (saturated) suction temperatures most of which are well above those for which present compressors are designed. A systematic series of experiments is being conducted at evaporating temperatures in the range from 45 to 100°F using a Solar Heat Pump Simulator and a specially designed Laboratory Model Heat Pump assembled from off-the-shelf components. Two reciprocating compressors have been tested thus far - an open type driven by a 2-speed motor and a hermetic 2-speed, the multi-speed feature providing capacity control, which is a virtual necessity for effective use of solar source. Thorough and highly accurate instrumentation is used in the simulator and in the heat pump refrigeration loop. The results to date of the compressor aspects of the solar heat pump experiments at BNL are described, and the general application of heat pumps and their compressors to use with solar input are discussed.

31880 (CONF-791239—) **Final proceedings of the Third Solar Heating and Cooling Demonstration Program Contractors' Review.** (Kaba Associates, Inc., Washington, DC (USA)). May 1980. Contract AC01-CS30114. 771p. NTIS, PC A99/MF A01.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

One hundred and seven papers are included. Separate abstracts were prepared for each paper. The summaries of the small group discussions were not abstracted. (MHR)

31881 (CONF-791239—, pp 1-5) **Town of Concord, Massachusetts solar space heating project at the Municipal Light Plant building.** Hartwell, D.W. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This retrofit solar space heating system uses 1932 ft^2 of single-glazed selective surface, air flat-plate collectors and 64 tons of rock storage. The collectors had excessive leakage and the new collector array was operational in mid-October, 1978. Problems with control equipment and data monitoring system are presented. (MHR)

31882 (CONF-791239—, pp 7-9) **Kennebec River double-decker greenhouse is designed to solar retrofit store, offices.** Poitras, R. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The Northeast Carry building is a standard 100-year-old brick building on the banks of the Kennebec River in historic Hallowell. The building houses offices and a small store in 800 square feet of floor space. The lack of clear, precise boundaries between properties, and resistance from adjacent property owners and Hallowell's historic community necessitated a shift in the proposal. The redesigned collector encloses approximately 200 square feet of the southeast face of the building and is not readily visible from the street.

The proposed collector will provide between 20 and 30 percent of the building's heating requirements. (MHR)

31883 (CONF-791239—, pp 11-20) **Experiences and cost analysis gained during design and construction of the Contemporary Systems Inc. solar center in Walpole, N.H.** Christopher, J.C. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The building is a 91% solar sufficient structure located in a 7,600° day climatic zone. The solar energy system provides space heating through three (3) independent solar energy systems. An 800 sq ft active, air-type collection system supports the base heating load of the structure. This is supplemented by 190 sq ft of direct passive gain window area loacted in the production and office areas. In addition, a 360 sq ft attached hybrid sun-space provides added heating and storage capacity for the office area. The total system is attractively and functionally integrated into the building structure. The total cost of the active system installation was # 20,448. These costs are presented in detail. Roofing credit allowance and Federal Income Tax Credit are discussed. For the first four months of operation, through the end of November 1979, no auxiliary heating was required. (MHR)

31884 (CONF-791239—, pp 21-29) **Telluride school: a solar retrofit.** Slack, P.D. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

Project progress is reviewed from the design process through the procurement of permits, bidding, and construction. Standard glazing systems are applied to the gymnasium walk to form a Trombe wall and a new structure is added to the classroom wing to form a greenhouse. (MHR)

31885 (CONF-791239—, pp 31-34) **Construction, operation and maintenance of Spearfish High School.** Hengel, R.J. (Solar Heating System, Spearfish, SD). May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This system uses 8034 ft^2 of flat-plate collectors for 46550 ft^2 of building. It incorporates six heat pumps and 4100 ft^3 of rock storage for the solar air heating system. Construction details of the rock box and collector installation are included. (MHR)

31886 (CONF-791239—, pp 35-37) **Instrumentation for a passive and active solar heated animal control center.** Rouzer, C.W.; Longa, J.D. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

An addition to the Albuquerque Animal Control Center incorporates both active and passive solar elements. The open, active loop has 48 Solcan collectors with 1500 gallons of storage to supply hot water to radiant floor panels and fan coil units. Passive gains provide additional heat for 4300 ft^2 of kennel and 2800 ft^2 of office space with adjustable reflector/insulator panels to regulate the heat flow through 425 ft^2 of glazing. The combined system provides 68% of the heating requirements in the facility. The particular parameters to be measured were selected to provide information on the overall performance of the building and its systems. The major areas of interest are: the active solar contribution and efficiency, and the passive solar contribution and efficiency. Insolation levels, weather variables, fluid temperatures, fluid flow, building conditions, energy auxiliary requirements, electrical power, and status indicators are the parameters to be measured. These measurements are transmitted to a small computer on-site, which in turn, is coupled to a large computer system elsewhere. The instrumentation is listed and discussed. (MHR)

31887 (CONF-791239—, pp 39-40) **Solar space heating system.** Sartor, D. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The retrofitted system uses 720 ft^2 of hydronic flat plate collectors and a 1050 gallon fiberglass tank for storage. An atrium corridor will add a passive contribution. (MHR)

31888 (CONF-791239—, pp 57-74) **Stanford University Central Food Services Building solar space and domestic hot water heating system.** Beavers, C.L. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

An active hydronic system for domestic hot water and space heating is described using 840 ft^2 of flat plate, liquid, single-glazed collectors. Storage is 1550 gallons of water in steel tanks. Schematics and thermal performance of the retrofitted system are provided. (MHR)

31889 (CONF-791239—, pp 103-111) **Solar energy heating and cooling of an academic building on the Columbus Technical Institute Campus.** Jordan, R.W.; Pearson, R.J. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

An active hydronic heating and cooling system with absorption cooling is described using 3494 ft^2 effective collector area and a 5000 gallon underground insulated steel tank. The design, construction, and operation of the system are presented. (MHD)

31890 (CONF-791239—, pp 113-122) **One year's operation report of the solar air conditioning, heating, hot water and pool heating system for the life clinic.** Hudson, W.T. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

An active hydronic retrofitted system with absorption cooling is described using 4954 ft^2 aperture of black chrome, double low-iron glazed flat-plate collectors. The storage capacity is 10,000 gallons of chilled water, and 5000 gallons of hot water in pressurized tanks. (MHR)

31891 (CONF-791239—, pp 135-140) **Shelby Oaks-Quad IV Office Complex Memphis, Tennessee.** Alperin, A.M. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active solar air heating system uses 780 ft^2 of flat-plate collectors and 390 ft^3 of rock storage. The design philosophy, operation, cost, and problems are discussed briefly. (MHR)

31892 (CONF-791239—, pp 141-144) **Quitman County Bank.** Alperin, A.M. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This solar air heating system uses 468 ft^2 of flat plate collectors and 285 ft^3 of rock bed storage. The energy conservation methods are described. The design philosophy, operation, problems, and costs are discussed. (MHR)

31893 (CONF-791239—, pp 145-148) **Security State Bank, Starkville, Mississippi.** Alperin, A.M. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

An active solar air heating system is described using 312 ft^2 of flat-plate collectors and 96.2 ft^3 of rock storage. Energy conservation measures, design philosophy, operation, problems, and costs are reviewed. (MHR)

31894 (CONF-791239—, pp 149-161) **Application of commercial integrated solar space heating, space cooling and domestic hot water for the Georgia power company's Atlanta office building.** Hensley, W.R.; Jones, D.H. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

An active hydronic solar heating, cooling, and water heating system with absorption cooling is described. The system uses 23,696 ft^2 of parabolic trough collectors, a 300,000 gallon chilled water tank, and a 50,000 gallon hot water storage tank. The building design, the solar system designs, and the energy performance are reviewed. (MHR)

31895 (CONF-791239—, pp 163-170) **Sunforest Medical Building Toledo, Ohio.** Pearson, R.J.; Frissora, J. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

An active hydronic solar heating, cooling, and water heating system with absorption cooling is described. The system uses 3822 ft^2 net area of drainable, evacuated tube collectors, a 30,000 gallon chilled water tank, and two 3000 gallon insulated steel hot water tanks. The system overview, heating-cooling terminals, bated collection and chiller operation, chilled water storage, heating loop operation, microprocessor control, and operating experience are presented. (MHR)

31896 (CONF-791239—, pp 171-175) **Solar space and water heating for Shoney's Restaurant in North Little Rock, Arkansas.** Perry, E.H.; McAlexander, W.G.; Todd, T.R. Jr. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

An active hydronic solar system is described using 1500 ft^2 of flat plate collectors and 1500 gallon storage capacity. The design philosophy and project status are reviewed. (MHR)

31897 (CONF-791239—, pp 177-180) **Solar space heating & domestic hot water. A retrofit systems, Cherry Hill Inn.** Colm, H. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The Inn is a combination country inn, hotel, and convention center with indoor and outdoor swimming pools, accomodations for 600 guests, and meeting facilities for 4000 people. The active hydronic solar system uses 5733 ft^2 (gross) of evacuated tube collectors and a 7500 gallon stainless steel storage tank. Some problems are described, briefly. (MHR)

31898 (CONF-791239—, pp 181-187) **Report on Project Sunburst. A Department of Energy commercial solar demonstration at Richland, Washington.** Scott, J.L.; Hillesland, D. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

An active solar space heating, cooling, and water heating system for a 14,400 ft^2 office building is described. An array of 6000 ft^2 of roof-mounted ethylene-glycol/water cooled flat-plate collectors supply energy through a heat exchanger to an underground insulated 9000 gallon thermal energy storage tank. A 25-ton solar hot water-driven Arkla absorption chiller cools water in a 2000 gallon storage tank. Project status and problems are reviewed. (MHR)

31899 (CONF-791239—, pp 189-192) **Summary-solar space heating system San Francisco Environmental Center.** May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The San Francisco Environmental Center, will be the first high-rise building to fully integrate a solar collection system into the building envelope. The solar collectors will be integral parts of the southerly oriented balcony on the new nine-story, 60,000 square foot retail and office building. The solar system is a closed loop, pressurized system, integral with the building hydronic heating system. Twenty-eight single glass-glazed, copper flat plate collector panels are mounted on the south face of the building in an array of four seven-panel rows, yielding a total gross collector area of 896 square feet. Inhibited water is circulated between the collector array and an 1825 gallon storage tank located in an equipment room above the level of the highest collector row. The storage tank is of unlined steel construction, and is insulated to R-30. (MHR)

31900 (CONF-791239—, pp 193-196) **Solar Way building: a commercial solar demonstration project utilizing a phase change material for thermal storage.** Bliege, C.L. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

An active air solar space heating, space cooling, and water heating system is described using sodium sulfate decahydrate as storage media. These are 900 ft^2 of flat-plate collectors. The system description, installation, operation, and problems are reviewed. (MHR)

31901 (CONF-791239—, pp 197-200) **Construction review: Maricopa County Courts Building, Scottsdale, Arizona.** Lane, T.S.; Lennon, S. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

An active hydronic solar heating, cooling, and pool heating system with absorption cooling is described. The system uses 2700 ft^2 of tracking, concentrating collectors and a 5000 gallon storage tank. Experience in construction and installation is reviewed. (MHR)

31902 (CONF-791239—, pp 201-202) **New Mexico Human Services Department Field Office, Taos.** Mingenbach, W.; Pool, S. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This single story 12300 ft^2 masonry building incorporates several energy conservation and passive solar features. These features include 2,000 ft^2 of double glazed roof apertures, reflective roofing to augment gain, reflective insulated automatic shutters, water-filled drum thermal storage, and aluminum reflective ceilings above the storage drums. Thermal storage is 70 pounds of water per square foot of aperture. Design considerations and problems are reviewed briefly. (MHR)

31903 (CONF-791239—, pp 203-207) **Earth integration solar space heating and solar hot water systems, Amity Elementary School, Boise, Idaho.** Smull, N.H. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This 51,400 ft^2 building has rigid insulation and earth cover at walls and roof. Net collector area is 2180 ft^2 for space and water heating. Design, constuction, and operation details are reviewed briefly. (MHR)

31904 (CONF-791239—, pp 213-217) **Danbury Hospital solar energy project.** Kuszpa, F.J. Jr. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar space and water heating systems uses 18,795 ft^2 of flat plate collectors and 47,000 gallons of storage capacity. The design philosophy, system operation, problems and costs are reviewed briefly. (MHR)

31905 (CONF-791239—, pp 219-228) **Wilmington Swim School solar system.** Breck, T.T. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The active hydronic solar heating and water heating system uses 2500 ft^2 of flat plate collectors and a 2800 gallon insulated concrete storage tank. A vertical wall passive collection system constructed as part of a new addition will provide approximately 25 percent of the heated fresh air requirements for the office area. The facility description, organization of the construction process, solar storage tank, control system, boiler room and general piping, and roof mounted solar panel system. (MHR)

31906 (CONF-791239—, pp 229-232) **Fern Engineering Company solar space heating system Bourne, Massachusetts.** Levine, P. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This system uses two-pass, air-heating collectors 90 ft in length with a single inlet and outlet at one end. An air-to-water heat exchanger transfers heat to a 1500 gallon storage tank. A system efficiency of 40% was calculated. (MHR)

31907 (CONF-791239—, pp 233-243) **Northview School, Howards Grove, Wisconsin.** Groth, G.F. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active solar air heating system uses 2277 ft^2 of two-pass flat-plate collectors and a 1500 ft^3 rock bin. The design and construction phases and problems are described. (MHR)

31908 (CONF-791239—, pp 243-246) **Solar preheat system athletic and recreational facilities, New Hampshire College, Manchester, New Hampshire.** Snow, E.D. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This solar air preheating system uses 3400 ft^2 of flat plate collectors. The design considerations and problems encountered are reviewed. No storage was provided. (MHR)

31909 (CONF-791239—, pp 253-259) **Longfellow School, Marion, Iowa.** Hynes, J.M. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar space heating system uses 4896 ft^2 of flat plate collectors and 8000 gallons storage capacity. This drain down system was retrofitted to a school building converted to administrative offices. The design philosophy, system operation, construction problems, successful components, costs, and lessons learned are reviewed. (MHR)

31910 (CONF-791239—, pp 261-266) **Solar heated office building for the Burns/Peters Group, Architects/Planners, Albuquerque, New Mexico.** Burns, W.L.; Shishman, T.T. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar space and water heating system uses 880 ft^2 of tracking parabolic collectors and an 1800 gallon storage tank for the 6000 ft^2 office building. The design, mechanical systems, and performance are reviewed. (MHR)

31911 (CONF-791239—, pp 267-270) **Solar heating system: Wyoming Rural Electric Association Office Building, Casper, Wyoming.** May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The 9000 ft^2 building was designed for energy conservation. The active hydronic system uses 870 ft^2 of flat plate collectors and a 1700 gallon storage tank. The operation of the control system is described. (MHR)

31912 (CONF-791239—, pp 271-279) **Construction of the New Mexico Solar Energy Institute and College of Engineering hybrid solar building.** Lumsdaine, E.; Farrer, R. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

Construction of the New Mexico Solar Energy Institute (NMSEI) and College of Engineering hybrid solar building is now approximately half completed. The building uses an air-cooled active solar system and passive solar design concepts together with other energy-conserving measures to achieve a structure which will be a good example of energy-efficient design and construction, yet will be functional and aesthetically pleasing. A number of problems have been encountered during the design review and construction phases to date. These include changes in the size of the collector array, selection of the collectors, design and construction of the rock boxes for the active system, and specification and supply of the rocks for the rock boxes. These experiences are described and discussed.

31913 (CONF-791239—, pp 281-283) **City of Huntsville Senior Citizen's Center solar heating and hot water system.** Bowden, D.R. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic system uses 26 flat plate collector panels 26-ft long and 6 1/2 ft wide and a 3,000 gallon insulated water tank retrofitted to the existing building. Double glazing and insulation were added to the full glass walls on the north and east. (MHR)

31914 (CONF-791239—, pp 285-293) **Descanso Gardens Guild exhibition and educational arboretum and community complex.** Collins, D.L. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This system has active hydronic features with absorption cooling plus passive heating and cooling. It uses 2640 ft² of flat-plate collectors and 2 3440 gallon steel tanks for storage. The design features of the building, cultural aspects, and system features are review. (MHR)

31915 (CONF-791239—, pp 301-307) **Alabama Power Company, Montevallo District Office, solar heating and cooling system.** Reardon, G. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The office building is an energy-efficient design which incorporates innovative architectural techniques and a solar-assisted heating, cooling, and domestic hot water system, and an off-peak cooling storage system. The system includes 2340 ft² of double-glazed collectors with black chrome selective coating, an 8000-gallon hot water storage tank, a 105 kW boiler, a 30-ton reciprocating chiller, a nominal 25-ton absorption chiller, and an 8000-gallon chilled water storage tank. Problems encountered are discussed. (MHR)

31916 (CONF-791239—, pp 309-311) **Project status update: Corona Del Sol High School solar system, Tempe Union High School District.** Hofmann, J.; Coyle, P. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The present status and operating experience of the solar system space heating and service hot water system are described. The system has 20,621 ft² of flat-plate collectors and a 47,000 gallon storage tank. (MHR)

31917 (CONF-791239—, pp 321-325) **Proposed Western Energy office building.** Boyd, J.B. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The proposed solar heating system for the 4400 ft² building consists of 528 ft² of copper hydronic flat plate collectors, a water storage tank with submerged heat exchangers, radiant heating copper floor coils embedded in concrete, solar circulation pumps, space heat circulation pumps, and electric backup circulation heaters. The system is to provide domestic hot water preheating and indirect space heating. The schedule calls for installation of the solar system in December 1979 and January 1980. (MHR)

31918 (CONF-791239—, pp 333-340) **Integrated solar heating, cooling and hot water system for the San Diego city schools', University City High School, San Diego, California.** Fergin, R.K.; Canner, R.E. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar heating, cooling, and water heating system uses absorption cooling, 19,500 ft² of concentrating, tracking collectors, and 99,900 gallons of storage. The collectors are 85% parabolic and 15% Fresnel lens concentrating collectors for comparison. The design philosophy and problems are reviewed. (MHR)

31919 (CONF-791239—, pp 341-343) **1979 progress report on the Olive Grove shopping center in Westlake Village, California.** Felburg, R.A. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

With R-20 insulation in the walls and R-40 insulation in the roofs, the entire 100-store shopping center comprised of eight 2-story buildings under a single roof (with seismic connections between buildings) will be 95 to 100 percent heated and cooled by solar energy. Twenty-five thousand square feet of non-tracking modified Winston-type concentrating collectors will be utilized for this function. Another 3000 square feet of these collectors will provide domestic hot water for the three restaurants and the theater-dinner-house. Each of these four domestic hot water systems, as well as the central heating and air conditioning solar system, utilize gas-fired boiler back-up systems and polyurethane insulated high temperature epoxy fiber glass storage tanks. Each of the four restaurants makes use of 500-gallon rooftop R-60 storage tanks. The two 25,000-gallon high temperature epoxy fiber glass hot water storage tanks of the central solar system have been insulated with more than eight inches of polyurethane foam. Other solar elements in the shopping center plan include three 65,000-gallon cold tanks, two 10 kW photovoltaic systems, and two freon-type Rankine engines for pumping water. (MHR)

31920 (CONF-791239—, pp 345-353) **Santa Clara Community Recreation Center solar heating & cooling project.** Saunders, R.G. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The system uses 7085 ft² of double-glazed, selectively coated flat plate collectors, 10,000 gallons hot water storage, and 50,000 gallons of chilled water storage. The system description, design and construction, problem areas, and operation are reviewed. (MHR)

31921 (CONF-791239—, pp 355-364) **Solar heating and hot water for the Littleton, Colorado, municipal building.** Blosten, C. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This 56,000 ft² building uses 9288 ft² of flat-plate collectors and two 13,900 gallon storage tanks. Summaries are included of the building design construction, solar system, operation, and costs. (MHR)

31922 (CONF-791239—, pp 365-367) **Executive East, a solar retrofit.** Gohlinghorst, C.D. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This 25,000 ft² office building was retrofitted with 2561 ft² of single-glazed selectively coated copper, liquid flat-plate collectors augmented by 2927 ft² of polished aluminum reflectors. Heat storage is a 6000 gallon tank. The system operation is reviewed here. (MHR)

31923 (CONF-791239—, pp 369-371) **Solar heating and DHW system housing project for the elderly, Hamden, Connecticut.** Krenicki, W. Jr. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This solar heating and water heating system was 130 sq ft of non-selective copper flat plate collector per living unit and a 1600 gallon concrete storage tank for four living units. Problems encountered with the system are reviewed. (MHR)

31924 (CONF-791239—, pp 373-383) **Heating and cooling of a Florida office building.** Hancock, O.G. Jr. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic space heating and cooling system uses absorption cooling, 1760 ft² of evacuated tube collectors, 3000 gallons of hot water storage, and 6000 gallons of chilled water storage for this 5000 ft² building. The design philosophy and problems encountered are reviewed. (MHR)

31925 (CONF-791239—, pp 385-391) **Operating experience: North Georgia Area Planning and Development Commission Office Building.** Sutherland, G.; Kolberg, D.W. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar heating, cooling, and water heating system uses 2001 ft² of double-glazed flat-plate collectors, absorption cooling, 3000 gallon hot water storage, and 5000 gallon chilled water storage for this 7000 ft² building. The system operation and maintenance, problems, and operational costs are reviewed. (MHR)

31926 (CONF-791239—, pp 393-397) **St. Charles High School solar heating project, St. Charles, Illinois.** Spurling, D.F. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This 221,000 ft² structure uses 12,892 ft² of single-glazed, selective surface collectors and various tanks for hot water and chilled water. The problems encountered are reviewed. (MHR)

31927 (CONF-791239—, pp 399-408) **Solar energy system for the office and laboratory building, State of Illinois, Department of Agriculture.** Wilkin, C.C. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

A new 145,000 ft², $8 million office and laboratory building with a $1 million solar energy system for the State of Illinois Department of Agriculture is presently under construction at the Illinois State Fairgrounds, Springfield. This project will make possible the consolidation of the presently scattered offices of this department into one building. Design was started in 1976, and completion is scheduled for 1981. The objective here is to present bidding procedure problems as they relate to collector performance data and the ability to make a fair comparison of alternative collectors. Problems, complications and delays encountered in dealing with an embryonic, rapidly developing industry providing experimental components are discussed. (MHR)

31928 (CONF-791239—, pp 409-412) **Performance of the solar retrofit at Clarksville Middle School.** Galbreath, J.W.; Rademaker, R.W.; White, R.N. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The solar heating retrofit at Clarksville Middle School, Clarksville, Indiana, consists of 6520 square feet of flat plate liquid collectors, a 10,000 gallon buried, insulated steel tank and associated equipment for space heating two large gymnasiums. The system uses 50% glycol solution in storage with no heat exchanger. Operational information performance and problems are reviewed. (MHR)

31929 (CONF-791239—, pp 413-418) **Scattergood School's solar heated recreation building.** Heins, C.F. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The building uses hot air to heat 6900 sq ft gymnasium and preheat water for showers. The collector array consists of 128 Solaron 2001 flat plate collector the panels attached at an angle of 50 degrees to the south wall of the gymnasium. An insulated, reinforced concrete box 8 ft by 10 ft by 25 ft, located under the collector and containing about 65 tons of washed river gravel, provides heat storage. Sitting on this box is a 5000 cfm air handling unit. Air is distributed to the gymnasium through overhead ductwork and a series of double deflection registers. Supplementary heat is furnished by a 250,000 Btu/hr propane heater mounted in a corner of the building. The collector heats water by means of a heat exchanger built into the ductwork. Water is stored in the two 120-gallon tanks. The water serves as pre-heated water for a 52-gallon, fast recovery electrical water heater. The system was designed to provide about 75% of the space and water heating needs of the building during the heating season. Some performance data are used to evaluate the assumptions and design philosophy that were used originally, and to suggest changes that might improve any future systems. (MHR)

31930 (CONF-791239—, pp 419-420) **Johnson County Jail, Iowa City, Iowa.** Schoenfelder, J.L. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active, forced air, solar space, ventilation air, and water heating system uses 1857.6 ft^2 of flat-plate collectors and a 3500 gallon steel storage tank. The design philosophy, system operation, and actual cost are discussed briefly. (MHR)

31931 (CONF-791239—, pp 421-422) **Southeast of Saline K-12 School Kansas unified school district 306.** Hall, J.M. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

Problems encountered in a year of operating experience are reviewed. (MHR)

31932 (CONF-791239—, pp 423-427) **Kansas Cosmosphere and Discovery Center solar heating.** McLain, L.J. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar space and water heating system uses 2775 ft^2 of flat-plate collectors and 6000 gallons of storage capacity. The building and site, solar system, design, and construction are described. (MHR)

31933 (CONF-791239—, pp 429-431) **Kaw Valley Solar Bank, Topeka, Kansas.** Slemmons, R.S. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar space heating and cooling and water heating system uses 1068 ft^2 of evacuated tube collectors and 1100 gallons of hot water storage. The operating history of the project is reviewed briefly. (MHR)

31934 (CONF-791239—, pp 433-435) **Comparison of a liquid and an air solar flat plate heating system and a liquid concentrator system applied to the same structure as applied at Rademaker Corporation, Louisville, Kentucky.** Rademaker, R.W. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

These systems use 240 ft^2 of liquid flat-plate collectors, 195 ft^2 of flat plate air collectors, and 240 ft^2 of concentrating collectors. Five hundred and sixty gallons of water was stored in steel tanks and 78 ft^3 river gravel in the rock bed. The operation and problems of the systems are reviewed. (MHR)

31935 (CONF-791239—, pp 437-443) **Solar heating for field house, Louisiana State University.** Evans, W.J. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This solar space and water heating system uses 4760 ft^2 of effective flat-plate collector area and an insulated tank of 10,000 gallon capacity for the 101,000 ft^2 building. The design, construction, thermal expansion problems, and planned revisions are reviewed. (MHR)

31936 (CONF-791239—, pp 445-448) **Solar energy applications Germantown campus, Montgomery Community College as viewed after a year's service.** Meigs, W.L. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The systems include 9644 ft^2 of collector area for space and water heating for 139,846 ft^2 of building. A year's performance is reviewed here with fuel savings and a listing of problems and solutions included. (MHR)

31937 (CONF-791239—, pp 449-455) **Design - construction relationships of the Shady Grove passive/active solar office building.** Perina, R.G. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This solar space heating system uses 1500 ft^2 of active hydronic tubular collectors and a 3000 gallon steel tank. The design philosophy, the design and construction interrelationships, and other items of interest are reviewed. (MHR)

31938 (CONF-791239—, pp 457-462) **Solar heated and cooled fire station, Baltimore, Maryland.** Tang, K.F.; Hedden, R.E. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This solar space and water heating and cooling system uses 3584 ft^2 of black chrome coated flat-plate collectors and a 6000-gallon tank for heat storage. The building's energy conservation features, solar heating and cooling system, system control logic, and system performance are reviewed. (MHR)

31939 (CONF-791239—, pp 463-468) **Padonia Elementary School solar heating and cooling project.** Wilkening, H.A. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic system uses 3400 ft^2 of concentrating collectors, a 10,000-gallon steel hot water tank, and a 10,000-gallon steel chilled water tank. This collector uses the curved roof of a building as a substrate for a reflective surface. The solar receiver is essentially a flat-plate collector facing the reflector. The design philosophy, system operation, and operating experience are reviewed. (MHR)

31940 (CONF-791239—, pp 470-477) **Solar and ground water energy systems in the Technology Properties office building, Burlington, Massachusetts.** Zvara, J. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This solar space and water heating system uses 1872 ft^2 of hydronic flat-plate collectors and a storage capacity of 6000 gallons in two steel tanks. Back-up space heating is provided by a water-to-water heat pump using constant-temperature ground water as an energy source. The solar space heating system, the ground water back-up heating system, the ground water cooling system, the solar domestic hot water system, and the instrumentation systems are described. (MHR)

31941 (CONF-791239—, pp 479-486) **Design, construction and performance of a retrofit solar system for Madison Hall, a residence building on the Cedar campus of Jordan College in Cedar Springs, Michigan, U.S.A.** Coxon, L.K. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This 7250 ft^2 building has 2080 ft^2 of flat-plate collectors, one 5000-gallon heat storage tank, a 300 gallon day tank, and 2-80 gallon DHW tanks. The design philosophy, construction, and maintenance of this system are reviewed. (MHR)

31942 (CONF-791239—, pp 487-495) **Esslinger Medical Building, Traverse City, Michigan.** Moutsatson, G.P.; Grant, R.A. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This solar active air space and water pre-heating system uses 663 ft^2 of double-glazed flat plate collectors and 342 ft^3 of pebble bed heat storage. The design philosophy, system operation, problems and solutions, successful components or processes, costs, and lessons learned are reviewed. (MHR)

31943 (CONF-791239—, pp 497-514) **Project Sunrise. First look at a northern latitude commercial building retrofit solar heating system, Pellston, Michigan.** Sieradski, L.M. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The Sunrise warehouse and office buildings have south facing vertical walls with a combined length of 300 feet. The 13 foot by 200 foot long south facing walls of the Cuckler built steel warehouse provide an attractive cost effective mounting surface for the Sunrise modular air solar collectors. The combination of 45.4°N. Latitude and existing south facing walls provided an ideal design solution for

a retrofit space heating solar system. A cost-effective design goal of 50% solar fraction was chosen. Recent analysis shows the Project Sunrise system may provide as much as 64% annual solar fraction. To achieve this 64% estimate, two (2) - 12' x 96' collector arrays (1152 sq ft each, 2304 sq ft total) have been mounted to a newly installed wolmanized plywood and post and beam wall. The steel skin of the existing south facing wall was removed to provide a uniform mounting surface and to eliminate purchasing new steel roofing material to provide the continuation of the old north slope of the office roof. The required collector back-panel insulation interior to the wolmanized plywood wall also provides enhanced building thermal insulation during periods of low or zero solar radiation and collection. In future improvement steps the warehouse walls will be insulated to an R-19 value. All electric loading dock doors (5) and walkthru doors will be gasketed and insulated. The ceiling is being insulated to an R-19 value.

31944 (CONF-791239—, pp 523-526) **Plymouth City Hall solar heating system.** Fay, W.L. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar space and water heating system uses 1539 net sq ft of vacuum tube collectors and a storage capacity of 1000 gallons. The history of the project, the new proposal, and the heat transfer and storage revisions are reviewed. (MHR)

31945 (CONF-791239—, pp 527-531) **Solar heating and cooling for an underground building at the University of Minnesota.** Ramsey, J.W. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This system combines steam, hydronic, and air features and uses 6,600 ft^2 of liquid SLAT type collectors and an 8000 gallon steel storage tank. The design philosophy, system operation, system design, and operating experience are reviewed. (MHR)

31946 (CONF-791239—, pp 533-539) **Paulucci Planetarium Hibbing Community College, Hibbing, Minnesota.** Sandberg, R.Y. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This solar space and water heating uses 3600 ft^2 of line focusing concentrator and 225,000 gallon heat storage capacity. The design philosophy, costs, and operating experience are reviewed. (MHR)

31947 (CONF-791239—, pp 541-542) **Presentation of a solar heated public facility, city of Kansas City, Missouri.** May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active air solar space and water heating system for an 8800 ft^2 fire station uses 2808 ft^2 of flat-plate collectors and 1428 ft^3 of rock storage. Project history, costs, and operation experience are reviewed briefly. (MHR)

31948 (CONF-791239—, pp 543-546) **Kansas City capital of the Age of Enlightnment.** Chelnov, M. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar space and water heating system uses 2477 ft^2 of single-glazed copper selective flat-plate collectors and a 4000 gallon storage capacity. A solar system schematic and a system control flowchart are presented. Lessons learned are mentioned. (MHR)

31949 (CONF-791239—, pp 547-549) **Solar heating system Stephens College Visitors Center.** Henley, M. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar space heating uses 176 Honeywell/Lennox flat-plate collectors and a 5000 gallon storage tank. Control system problems are reviewed. (MHR)

31950 (CONF-791239—, pp 551-554) **Solar heating system for the Billings Shipping Corporation freight distribution facility, Billings, Montana.** Baker, J. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic space heating system uses 1980 ft^2 of flat plate air-to-liquid collectors. The design philosophy, costs, and construction and operating experience are reviewed. (MHR)

31951 (CONF-791239—, pp 555-557) **Solar heating demonstration project description: Young Men's Christian Association of Hastings, Nebraska.** Innes, V.A. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This closed loop hydronic solar space and water heating system uses 3080 ft^2 of flat plate collectors and 4600 gallon storage capacity for the 48,000 ft^2 building. The design features, design philosophy, system operation, and costs are reviewed briefly. (MHR)

31952 (CONF-791239—, pp 559-563) **Refurbishment of the operational solar system the housing authority office building city of Lincoln; Lincoln, Nebraska.** Nelson, C.G. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic space and water heating system uses 260 m^2 of flat-plate collectors and a 21,890 liter storage tank. Problems with the original system are presented in some detail. Plans to revitalize the solar system are discussed briefly. (MHR)

31953 (CONF-791239—, pp 567-576) **Somerset County Environmental Education Center Building solar energy system, design and maintenance.** Becker, P.C. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The 18,000 square foot building consists of two 9000 square foot stories, the lower of which is mostly underground. The solar roof faces 14° east of south and contains selectively coated aluminum flat-plate collectors. Two storage tanks, containing 2000 and 4000 gallons of water respectively, provide 6000 gallons of thermal energy storage. The building heat load is 831 million Btu, cooling is 174 million Btu. A conventional greenhouse roof was constructed by Lord and Burnham on the south exposure of the building. Roof slope is 18°. The roof consists of an aluminum framework glazed with 1/4" Lexan polycarbonate plastic. The collectors, glazed with a 1/25" thick sheet of Lexan, are suspended beneath the exterior roof in false purlins at a 40° angle. The roof construction allowed the installation of 3105 ft^2 of absorber plate in an overall roof area of 4090 ft^2. Experiences with the system and its maintenance over its three year life are reviewed. (MHR)

31954 (CONF-791239—, pp 589-592) **1979 contractor's review for a new 40,000 sq. ft. conventional cement block manufacturing facility completely solar heated and air-conditioned throughout. The facility is located in southern New Jersey.** Little, R.K. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar space heating and cooling system uses 6000 ft^2 of tracking, dual-glazed, selectively coated, copper tube, flat-plate collectors and four 10,000 and two 5000 gallon stainless steel storage tanks. The general description, technical problems, and innovative materials are reviewed. (MHR)

31955 (CONF-791239—, pp 597-600) **Bread Springs Elementary School retrofit solar heating project.** Whittenberger, W.W. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar space and water heating system uses 784 ft^2 of 3 x compound parabolic concentrators with non-evacuated receivers and an 1800 gallon storage tank for this 8852 ft^2 building. The building envelope modifications, solar system, instrumentation, problems, and operation are reviewed briefly. (MHR)

31956 (CONF-791239—, pp 601-602) **Solar heating project: Dayton T. Brown, Inc., Bohemia, New York.** Herlihy, J.E. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic system uses 36 foot collector arrays fabricated on-site and a 5000 gallon storage tank. Antifreeze is used in the drain-down system. Design and operation are reviewed briefly. (MHR)

31957 (CONF-791239—, pp 603-608) **Basin Electric Power Cooperative Headquarters solar heating demonstration project. Status report.** May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This status report is an update of the more extensive report presented at the 1977 and 1978 Contractors Review. The solar heating system has been made operational and is apparently functioning essentially as anticipated; however, data gathered to date have been insufficient to validate the design of the solar system. No unusual construction or maintenance problems were encountered to date that may be considered inherent to the solar collection aspects of our solar heating project.

31958 (CONF-791239—, pp 609-618) **Troy-Miami County Public Library.** Pearson, R.J.; Minardi, J.E. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This hydronic solar heating system uses 3264 ft^2 of evacuated tube collectors and a 5000 gallon underground steel storage tank for the 23,200 ft^2 building. The design philosophy, system operation, technical problems, and operating experience are reviewed. (MHR)

31959 (CONF-791239—, pp 619-634) **Multnomah County Oregon operations & maintenance complex.** May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The County's new two-story facility will be built largely underground, reclaiming an old landfill pit and reducing energy consumption in the building. Only half of the facility's upper floor is above grade and this portion is shielded by earth berms except for vehicle ramps and access portals. The low profile consrete structure is depressed 25 feet into the ground, minimizing its visual impact and reducing energy consumption 50% below that of an equivalent building on the surface. The 175,000 square foot shops building will incorporate approximately 15,000 square feet of solar collector panels on the building's roof providing all of the air conditioning and hot water needs and about half its heating. The building's service bays face north and south to ensure optimum exposure for the solar collectors and to allow skylighting over the center shop area for natural lighting. The solar system will be backed by an oil-fired boiler and supplemented with radiant gas heating during the winter. The system has a 22,500 gallon storage tank. (MHR)

31960 (CONF-791239—, pp 635-636) **Active/passive hybrid retrofit to the Ashland Community Foods Store of Ashland, Oregon.** Rounds, D. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The active portion of the system consists of 240 ft^2 air type collectors, located on the roof, injecting collected heat into the building air circulation system. The passive portion consists of a 160 ft^2 double-glazed skylight facing south that provides light and heat to the meeting hall on the second floor. There is no thermal storage other than that provided by the building's thermal mass. (MHR)

31961 (CONF-791239—, pp 637-646) **Solar space heating system for West Chester Work Center.** Haron, A.S. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar space heating system uses solar-assisted heat pumps in the office section and a water-to-air coil in the storeroom section. The system has 1900 ft^2 of single-glazed selective flat-plate collectors and a 6000 gallon steel storage tank. Operation of the system during the 1978-79 heating season in discussed in detail. (MHR)

31962 (CONF-791239—, pp 647-651) **Riverside Elementary School solar system.** O'Connell, W.J. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic, pressurized, drain-down system for solar heating, cooling, and water heating uses 7336 ft^2 of evacuated tube collectors, and two 15,000 gallon and one 7000 gallon ASME steel tanks. The design philosophy and design and construction problems are reviewed. (MHR)

31963 (CONF-791239—, pp 653-659) **Sullivans Island Elementary solar heating and cooling demonstration project.** Rast, G.B. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic system uses absorption cooling, 3500 ft^2 of evacuated tube collectors, 5000 gallon hot water storage, and 5000 gallon chilled water storage in steel tanks. The design philosophy and anticipated problems are reviewed. (MHR)

31964 (CONF-791239—, pp 661-665) **Solar heating and cooling of Mount Rushmore National Memorial Visitor Center.** Chiang, C.W. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar heating and cooling system uses 2000 ft^2 of flat-plate collectors, absorption cooling, and a 3000 gallon steel storage tank. Problems, design modifications, and nocturnal radiation are discussed. (MHR)

31965 (CONF-791239—, pp 667-671) **Solar heating system for the Coca-Cola bottling works of Jackson, Tennessee.** McAlexander, W.G.; Perry, E.H.; Todd, T.R. Jr. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar space and water heating system uses 9480 ft^2 of evacuated tube collectors and 24,000 gallons of storage capacity. The design philosophy and problems encountered are reviewed. (MHR)

31966 (CONF-791239—, pp 673-675) **Solar heating and domestic hot water system North Dallas High School, Dallas, Texas.** Arnoid, F.P. Jr.; Bradley, O. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar space and water heating system uses 4800 ft^2 of flat-plate collectors and a 10,000 gallon steel storage tank. The system installation is reviewed. (MHR)

31967 (CONF-791239—, pp 677-680) **One Solar Place.** Braun, E.E. Jr. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic space and water heating system uses 1596 ft^2 of flat-plate collectors and two 2300 gallon concrete hot water storage tanks. The design, problems, and system operation for the office buildings are reviewed. (MHR)

31968 (CONF-791239—, pp 681-690) **Demonstration project North Hampton Park Recreation & Health Center.** Myers, R.P. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar heating, cooling, and water heating system uses absorption cooling, 3650 ft^2 of flat plate collectors, a 6000 gallon steel hot water storage tank, and a 2000 gallon steel chilled water storage tank. The design philosophy, operating sequence, problems, and operating experience are reviewed. (MHR)

31969 (CONF-791239—, pp 691-697) **Sky Harbour Elementary School solar heating, cooling, and hot water project.** Steinhauser, B.F. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar heating, cooling, and water heating system uses 6120 ft^2 of parabolic collectors, a two-stage lithium bromide chiller, and storage water temperatures of over 300°F. This building will be the most energy conserving space conditioned school in this climate. The building design, solar system design simulation, and possible problems are reviewed. (MHR)

31970 (CONF-791239—, pp 699-703) **Trinity University solar heating and cooling project, 1979.** Treat, C.H. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The Trinity project is a retrofit of an existing central plant which provides space heating, space cooling and domestic hot water for the campus athletic center and five dormitories housing about 500 students. This central plant serves nearly 300,000 square feet of floor area and, with the exception of fans and pumps, was previously powered entirely by natural gas. A discussion is presented of the recent operating experience gained from this project. This solar energy system utilizes 16,080 square feet (lens area) of Northrup tracking, concentrating collectors and 40,000 gallons of hot water storage in two buried, insulated, steel tanks. Solar powered cooling is provided by a 350 ton Carrier lithium-bromide absorption chiller which was already in the central plant. Nonsolar cooling is now provided by a 630 ton electric centrifugal chiller installed as part of this project. The system flow diagram is included.

31971 (CONF-791239—, pp 705-709) **Design of a large air solar heating system, Ogden, Utah.** Woods, J.L. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

A solar heating system is described for providing comfort heating to a 5500 square foot office complex in a large manufacturing facility. The solar system utilizies air as the heat transfer fluid and features a unique solar absorber surface, produced electrochemically, on aluminum solar receivers. Rock is utilized for heat storage. The system uses 3000 ft^2 of flat-plate collector area and 1200 ft^3 of rock bin. (MHR)

31972 (CONF-791239—, pp 715-716) **Report on Project North Avenue branch library, North Avenue and Essex Street, Richmond, Virginia.** Bruce, J.R. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This project is a single story branch library (7080 sq ft) designed for year-round use. The system is designed to use approximately 1600 net square feet of double glazed flat-plate collectors for solar space heating, cooling, and water heating. There are to be two 1700-gallon storage tanks for storing the solar heated water. The project plans and specifications are now being reviewed to determine possible changes to produce savings in costs prior to rebidding the project. (MHR)

31973 (CONF-791239—, pp 721-723) **Solar heating and hot water system new main building, Alderson Broaddus College, Philippi, West Virginia.** Wilson, W. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar space and water heating system uses 3150 ft^2 of single-glazed flat-plate collectors and two 3000 gallon steel storage tanks for the 51,120 ft^2 building. The solar system cost budget is $129,973 and is supposed to provide 35% of the building's heating and hot water requirements. The solar system work is underway with roof mounted collector supports nearing completion in December 1979. (MHR)

31974 (CONF-791239—, pp 725-729) **Equine Management Center for Lakeshore Technical Institute, Cleveland, WI.** Groth, G.F. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This solar-assisted forced warm air heating for classroom and horse stalls and hot water heating uses 815 ft^2 of two-pass air, fixed, non-selective flat-plate collectors and 276 ft^3 of encapsulated water bin for the 17,424 ft^2 building. Water is packaged in 1 in. x 8 in. x 8 in. stackable plastic containers for storage. Construction has not started. (MHR)

31975 (CONF-791239—, pp 731-739) **Control of a solar assisted heat pump system.** Zien, H.B. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This solar-assisted water-to-air heat pump uses 756 ft^2 drainable liquid evacuated tube collectors and a 4000-gallon concrete storage tank for the 8000 ft^2 office building. The design philosophy, system overview, hydronic system control, solar system control, and failsafe and redundant equipment are reviewed. Problems related to heat pump reliability and corrosive well water are mentioned. (MHR)

31976 (COO—2704-22) **Evaluation of the solar building, Albuquerque, New Mexico. Final report, April 1974-September 1978.** Gilman, S.F. (Pennsylvania State Univ., University Park (USA). Dept. of Architectural Engineering). Dec 1979. Contract EY-76-S-C2-2704. 76p. NTIS, PC A05/MF A01.

During portions of the 1974-1975 and 1975-1976 winter heating seasons, a field evaluation was made of a solar-assisted heat pump heating system in a small commercial office building in Albuquerque, N.M. The system was comprised of one main water-to-water heat pump and five small water-to-air heat pumps. The liquid-type solar collector array had an area equivalent to about 10% of the building floor area. Other than the ethylene glycol/water solution circulated through the solar collector array, water was used in all parts of the system, including three thermal energy storage tanks. Considerable information concerning this project has been disseminated through conferences, workshops, technical papers at professional society meetings, reports to the federal government and Master of Science theses, all of which are referenced in this report. The work done on this project over the period of the contract is summarized and pertinent information concerning the building, the solar-assisted heat pump system, data acquisition aspects, results, and conclusions are included.

31977 (COO—4483-F) **Analysis of advanced thermal storage subsystems for solar heating and cooling. Final report, October 1, 1977-September 30, 1978.** Offenhartz, P.O'D.; Marston, J.M.; Watts, J.I. (EIC Corp., Newton, MA (USA)). Nov 1979. Contract EG-77-C-02-4483. 198p. NTIS, PC A09/MF A01.

Computer models for heating, cooling, and advanced thermal storage subsystems have been developed in TRNSYS-compatible form. Simplified models for solar collection and building loads have been written, together with routines that simulate a variety of space conditioning and advanced storage devices. Simulations using various storage concepts have been carried out for four major applications: (1) space and domestic hot water heating; (2) solar assisted heat pumping; (3) absorption air conditioning; and (4) thermally activated heat pumping. Overall performance differences traceable to the performance of a storage unit were generally small. In particular, from an operational point of view, the H_2SO_4/H_2O storage system behaves in a fashion remarkably similar to water tank storage: collector temperatures (and efficiencies) were nearly identical. However, over the same temperature range, the $H_2/SO_4/H_2O$ system offers a factor of four advantage in volume, which may be offset in some climates by the requirement for a heat source at or above 5°C.

31978 (DOE/AL/10891—T1) **Impact of controls in passive solar heating and cooling of buildings.** Sebald, A.V.; Clinton, J.R. (California Univ., San Diego, La Jolla (USA). Energy Center). 1980. Contract AC04-79AL10891. 229p. NTIS, PC A11/MF A01.

Separate abstracts were prepared for the nine included papers. (MHR)

31979 (DOE/AL/10891—T1, pp A.1-A.31) **Controlled integration of Trombe wall and direct gain in passive solar residences.** Sebald, A.V.; Phillips, G.M. (Univ. of California, San Diego, La Jolla). 1980.

In Impact of controls in passive solar heating and cooling of buildings.

Proper controlled integration of Trombe wall and direct gain are analyzed for Albuquerque NM, Santa Maria CA and Madison WI. Designs are critiqued for both comfort (using a new comfort index) and backup requirements. It is demonstrated that proper control is necessary for the maintenance of comfort and the attainment of high solar fractions. A simple expression for backup requirements in all three climates as a function of glazing areas and control flags is presented.

31980 (DOE/AL/10891—T1, pp C.1-C.32) **Eliminating peak load auxiliary energy consumption in passive solar residences during winter.** Sebald, A.V.; Munoz, D. (Univ. of California, San Diego, La Jolla). 1980.

In Impact of controls in passive solar heating and cooling of buildings.

Simulation analysis is used in Albuquerque NM and Madison WI to address the following four questions: (1) Assuming a properly designed and controlled passive house, how does total backup consumption depend on the choice of peak load blackout periods. (2) What comfort penalties arise from properly coping with a variety of peak load blackout periods. (3) Where should off peak energy be introduced into the house. (4) What are the effects of imprecise information on short term future weather.

31981 (DOE/AL/10891—T1, pp D.1-D.27) **Index to quantify thermal comfort in homes.** Carroll, J.A.; Clinton, J.R. (UCSD Energy Center, La Jolla, CA). 1980.

In Impact of controls in passive solar heating and cooling of buildings.

The discomfort index proposed permits quantitative estimates of the comfort implications of residential building design during the heating season. Discomfort under steady-state conditions is estimated from the squared difference between the actual and a preferred temperature (which varies with assumed clothing and activity levels). The difference is found using a linear approximation to the ASHRAE ET which treats humidity effects only implicitly. The index also includes a penalty for thermal transients. The functional form of the index allows simple calibration for individual preferences. The proposed discomfort index is similar to the currently used Predicted Percentage of Dissatisfied, but is simpler and better suited to simulations of residential environments than the PPD. Computer simulations can integrate the index over a heating season along with energy use to estimate the overall thermal performance of a building. These two aspects of performance can then be combined into one overall index, by using thermostat settings as an indicator of the relative weights that people assign to comfort and energy use.

31982 (DOE/AL/10891—T1, pp E.1-E.30) **Efficient simulation of large, controlled passive solar systems: forward differencing in thermal networks.** Sebald, A.V. (Univ. of California, San Diego, La Jolla). 1980.

In Impact of controls in passive solar heating and cooling of buildings.

Mathematical aspects of Thermal Network (TN) models are discussed in detail. Emphasis is given to Forward Differencing (FD) because of its efficiency in large-controlled TN models. Accuracy is analyzed. Computational considerations are analyzed in detail. An example is given. FD in TN models is seen to be accurate and efficient in complex buildings. In addition, structural information contained in TN models is easily extracted as a bonus without simulation.

31983 (DOE/AL/10891—T1, pp F.1-F.14) **Response surfaces: summarizing complex simulation results in a manner suitable for inexpensive use by architects and builders.** Phillips. G.M.; Sebald, A.V. (Univ. of California, San Diego, La Jolla). 1980.

In Impact of controls in passive solar heating and cooling of buildings.

Response surfaces are proposed as a means for summarizing simulation results. This methodology is an inexpensive way to very accurately provide: assistance in choosing the minimum number of simulation runs needed to analyze a given problem, a simple way to summarize the results of a complex simulation analysis, and a very exact, closed form equation to represent the simulation. Essentially, this technique allows one to choose a small number of full simulations to analyze a given problem (e.g., integrating Trombe wall and direct gain in a passive solar house). A simple equation is then chosen to accurately represent the simulation. This equation is then used to accurately interpolate among the underlying simulations. These pseudo-simulations cost less than a penny to compute the auxiliary energy and comfort for an entire heating season. Standard errors under 3 therms can easily be achieved at this extremely low cost. Response surfaces also are useful in optimization problems involving thermodynamic models.

31984 (DOE/AL/10891—T1, pp G.1-G.6) **MRT method of computing radiant energy exchange in rooms.** Carroll, J.A. (UCSD Energy Center, La Jolla, CA). 1980.

From Proceedings of systems simulation and economic analysis conference; San Diego, CA (USA) (1980).

The MRT View Factor method presented in this paper couples each surface in a room to an MRT node, which acts as a clearinghouse for all radiative exchanges. An upward adjustment in the coupling between each surface and the MRT exactly cancels that surface's self-weight in the MRT. The adjustments also happen to

improve the accuracy of the conventional view factors implicitly assigned by MRT methods. The effects of surface emittance and air emittance (typically .05-.15 in residences) are modelled without difficulty. For greatest accuracy, radiation coefficients can be varied with temperature. This method is inherently free from heat balance errors and errors in the overall radiative coupling of each surface to its environment. Errors do occur in the implicit view factors, but errors such as this are inherent in any method which overlooks the gory details of the enclosure geometry. Coplanar surfaces cause the largest errors, and these errors can be compensated for if necessary.

31985 (DOE/AL/10891—T1, pp H.1-H.29) **Thermal network model of a passive solar house.** Carroll, J.A.; Clinton, J.R. (UCSD Energy Center, La Jolla, CA). 1980.

In Impact of controls in passive solar heating and cooling of buildings.

The thermal network simulation model is described. The house simulated is a wood frame building with slab floor, and has windows facing east, south, and west. It has a Trombe wall which may be vented to the interior or to an under-floor rockbed. The rockbed model is simple yet flexible, and provides for controlled smearing of thermoclines during both flow and no-flow conditions. Control capabilities include venting, shading, night insulation, thermostat setbacks, off-peak backup, and various rockbed controls. Thermal network diagrams are shown for the various conventional and solar components in the model, first in their original form and then in the simplified form actually used in the simulations.

31986 (DOE/AL/10891—T1, pp I.1-I.21) **Thermal network models of the sea-lab test buildings.** Clinton, J.R.; Carroll, J.A. (Univ. of California, San Diego, La Jolla). 1980.

In Impact of controls in passive solar heating and cooling of buildings.

A group of eight passive test buildings is under construction at an inland San Diego County site and a major goal of this project is a comparison of measured data with results of thermal network models. The design and construction details of the test buildings and the thermal network models which have been developed for simulations to be conducted are described. Component values for the networks were calculated according to standard ASHRAE methods with some minor modifications. Included are thermal networks for each of the buildings: conventional buildings, roof pond, clerestory, high mass (tilt-up concrete walls), glazed masonry (Trombe wall), water wall, direct gain, and attached sunspace. Each of the buildings has a north room and a south room. The 2-zone thermal network models incorporate this feature and allow investigation of heat transfer between zones.

31987 (DOE/CS/30367—1) **Heating/daylighting prototype development. Phase I, Passive and Hybrid Solar Manufactured Building Project. Interim report and project status report No. 1, 1 October 1979-29 February 1980.** Snyder, M.; Fraker, H.; Lindsey, L.; Braham, W.; Hallagan, W.; Huffman, J. (Butler Mfg. Co., Grandview, MO (USA). Research Center; Princeton Energy Group, NJ (USA)). 31 Mar 1980. Contract FC02-80CS30367. 63p. NTIS, PC A04/MF A01.

Climatological data, both representative (typical) and extreme conditions, relevant to building energy use in Grandview, Missouri are presented. The energy-related characteristics of a particular building and its use are merged with ambient weather conditions. The graphs depict daily fluctuations in the major categories of building heating/cooling load for the experimental building (Roof Runner facility) at Butler Research Center. Data input include hourly weather and building occupancy schedules, the geometry and fixed thermal characteristics (component R-values, heat capacities, etc.) of the prototype structure, and variable conditions (status of moveable insulating shutters, HVAC operating modes, etc.). The prototype systems to be incorporated in the new Roof Runner building are shown. Both warehouse (no ceiling) and office (suspended ceiling) system types are included. The diagrams conceptually depict the heat flows in several representative operating modes, sampling the wide variety of operating conditions which will be evaluated during the testing phase of this project. Cost estimates for the designs selected for construction are provided. (MHR)

31988 (DOE/CS/34223—01) **Training Community College faculty in the techniques and skills required for Solar Energy System installation.** Leo, R.J. (League for Innovation in the Community Coll., Los Angeles, CA (USA)). May 1980. Contract AC01-78CS34223. 65p. NTIS, PC A04/MF A01.

A project to train a specified number of community college, vocational/technical faculty in the techniques and skills required to install solar energy systems is described. The planning that led to the contract, the development and conduct of the training workshops, and the outcomes are detailed. An overall evaluation of the project and recommendations for the future are included. (MHR)

31989 (DOE/NASA/CR—161480) **Installation guidelines for solar heating system, single-family residence at William O'Brien State Park, Stillwater, Minnesota.** (Honeywell, Inc., Minneapolis, MN (USA). Energy Resources Center). May 1980. Contract AI01-76CS31037. 188p. NTIS, PC A09/MF A01.

The Solar Heating System installer guidelines are provided for each subsystem and testing and filling the system are included. This single-family residential heating system is a solar-assisted, hydronic-to-warm-air system with solar-assisted domestic water heating. It is composed of the following major components: liquid cooled flat plate collectors; water storage tank; passive solar-fired domestic water preheater; electric hot water heater; heat pump with electric backup; solar hot water coil unit; tube-and-shell heat exchanger, three pumps, and associated pipes and valving in an energy transport module; control system; and air-cooled heat purge unit. Information is also provided on the operating procedures, controls, caution requirements, and routine and schedule maintenance. Information consists of written procedures, schematics, detail drawings, pictures and manufacturer's component data.

31990 (DOE/NASA/CR—161482) **Solar heating and domestic hot water system installed at North Dallas High School. Final report.** (Dallas Independent School District, TX (USA). Office of the General Superintendent). May 1980. Contract FC01-78CS35204. 108p. NTIS, PC A06/MF A01.

This Document is the Final Technical Report of the Solar Energy System located at the North Dallas High School, Dallas, Texas. The system is designed as a retrofit in a three story with basement, concrete frame high school building. The building was air conditioned with an electric drive 300-ton chilled water central system in 1973. The building contains 126,000 square feet and the solar energy system will preheat 100 percent of domestic hot water and supply 47.5 percent of annual building heating requirements. During the building cooling seasons, the solar energy system will supply 100 percent of domestic hot water. The solar energy system consists of 4800 square feet (320 panels) Lennox/Honeywell flat plate liquid collector subsystem, and a 10,000 gallon steel tank storage subsystem circulating hot water producing 686.6 x 10^6 Btu/year (specified) building heating and domestic hot water heating. The start up date is December 4, 1979. Extracts from the site files, specification references for solar modification to existing building heating and domestic hot water systems, drawings, installation, operation and maintenance instructions are presented.

31991 (DOE/NASA/CR—161483) **Solar heating and hot water system installed at office building, One Solar Place, Dallas, Texas. Final report.** (Travis-Braun and Associates, Inc., Dallas, TX (USA)). Jun 1980. Contract AB01-77CS34093. 119p. NTIS, PC A06/MF A01.

This document is the Final Report of the Solar Energy System Installed at the First Solar Heated Office Building, One Solar Place, Dallas, Texas. The Solar System was designed to provide 87 percent of the space heating needs, 100 percent of the potable hot water needs and is sized for future absorption cooling. The collection subsystem consists of 28 Solargenics, series 76, flat plate collectors with a total area of 1596 square feet. The solar loop circulates an ethylene glycol-water solution through the collectors into a hot water system heat exchanger. The hot water storage subsystem consists of a heat exchanger, two 2300 gallon concrete hot water storage tanks with built in heat exchangers and a back-up electric boiler. The domestic hot water subsystem sends hot water to the 10,200 square feet floor area office building hot water fixtures. The building cold water system provides make-up to the solar loop, the heating loop, and the hot water concrete storage tanks. The design, construction, cost analysis, operation and maintenance of the solar system are described. The system became operational July 11, 1979.

31992 (DOE/NASA/CR—161484) **Solar heating and cooling system installed at Leavenworth, Kansas. Final report.** (Citizens Mutual Savings and Loan Association, Leavenworth, KS (USA)). Jun 1980. Contract FC01-78CS35193;AI01-76CS31024. 318p. NTIS, PC A14/MF A01.

The solar heating and cooling system installed at the headquarters of Citizens Mutual Savings Association in Leavenworth, Kansas, is described in detail. The project is part of the U.S. Department of Energy's solar demonstration program and became operational in March, 1979. The designer was TEC, Inc. Consulting Engineers, Kansas City, Missouri and contractor was Norris Brothers, Inc., Lawrence, Kansas. The solar system is expected to furnish 90 percent of the overall heating load, 70 percent of the cooling load and 100 percent of the domestic hot water load. The building has two floors with a total of 12,000 square feet gross area. The system has 120 flat-plate liquid solar panels with a net area of 2200 square feet. Five, 3-ton Arkla solar assisted absorption units provide the cooling, in conjunction with a 3000 gallon chilled water storage tank. Two, 3000 gallon storage tanks are provided with one designated for summer use, whereas both tanks are utilized during winter.

31993 (DOE/NASA/CR—161493) **Solar Energy System performance evaluation: seasonal report for Colt Pueblo, Pueblo, Colora-**

do. (International Business Machines Corp., Huntsville, AL (USA). Federal Systems Div.). Jun 1980. Contract AI01-76CS31037. 94p. NTIS, PC A05/MF A01.

The Colt Pueblo Solar Energy System was designed to provide space heating and hot water preheating for the US Department of Transportation Test Center at Pueblo, Colorado. The system consists of 583 square feet of Colt A-151 series flat plate liquid collectors, a petroleum-base thermal energy transport fluid, an 1100 gallon water-filled solar energy storage tank, pumps, heat exchangers, controls and associated plumbing. Cold water passes through a liquid-to-liquid heat exchanger internal to the solar energy storage tank to preheat the water supplied to a 30 gallon electric hot water tank. A parallel circulation loop also operates to transfer solar generated heat to the hot water tank. Solar Energy System piping is protected from freezing with heat tapes. There are five modes of system operation. (MHR)

31994 (DOE/NASA/CR—161494) **Solar Energy System Performance Evaluation. Seasonal report for Contemporary Newnan, Newnan, Georgia.** (IBM Federal Systems Div., Huntsville, AL (USA)). Jun 1980. Contract AI01-76CS31037. 81p. NTIS, PC A05/MF A01.

The Contemporary Newnan Solar Energy System was designed by Contemporary Systems, Incorporated, Jaffrey, New Hampshire, to provide 60 percent of the space heating and domestic hot water (DHW) for a two story residence located in Newnan, Georgia. The system consists of fourteen Contemporary System Series V warm air collectors (392 square feet), 328 cubic foot rock bin thermal storage containing 1 to 1 1/2 inch diameter stones, an air handler, heat exchangers, an 80-gallon DHW preheat tank, controls, associated plumbing and air ducting. Auxiliary heating is provided by an electric heat pump supplemented by electric resistance heaters when outdoor temperatures drop below 15 degrees fahrenheit. A 40-gallon electric hot water tank is supplied water through the 80-gallon preheat tank. The system has six modes of operation. This report includes the system description; typical system operation; system operating sequence; performance assessment; system performance; collector array, storage, hot water and space heating subsystem performance; operating energy; energy savings; and maintenance. This Solar Energy System became operational April, 1979.

31995 (DOE/NASA/CR—161495) **Solar energy system performance evaluation - Seasonal Report for Seeco Lincoln, Lincoln, Nebraska.** (International Business Machines Corp., Huntsville, AL (USA). Federal Systems Div.). Jun 1980. Contract AI01-76CS31037. 72p. NTIS, PC A04/MF A01.

The SEECO Lincoln Solar Energy System was designed to provide 60 percent of the space heating for the 50 seat Hyde Memorial Observatory in Lincoln, Nebraska. The system consists of nine SEECO Mod 1 flat plate air collectors (481 square feet), a 347 cubic foot rock storage bin, blowers, controls and air ducting. An auxiliary natural gas furnace provides additional energy when the solar energy is not adequate to meet the space heating demand. The system has five modes of operation. System description, typical system operation, system operating sequence, performance assessment, system performance, subsystem performance (collector array, storage, space heating), operating energy, energy savings and maintenance are discussed.

31996 (DOE/NASA/CR—161508) **Solar Energy System Performance Evaluation. Seasonal report for IBM System 1B, Carlsbad, New Mexico.** (IBM Federal Systems Div., Huntsville, AL (USA)). Jul 1980. Contract AI01-76CS31037. 76p. NTIS, PC A05/MF A01.

The IBM-Carlsbad Solar Energy System is located in a single family residence at Carlsbad Caverns National Park, New Mexico. This hot air solar heating and hot water system consists of 408 square feet of SEPCO, flat plate air collectors, a rock storage bin containing 12 tons of 3/4" to 2 1/2" diameter rocks, an energy transport system, air-to-water heat exchanger, controls and a hot water preheat tank which supplies preheated water to a 52 gallon electric hot water tank. An oil hot-air furnace supplies necessary energy when solar energy is insufficient to supply the space heating load. The system has five different modes of operation and became operational in March, 1978. The following topics are discussed: system description, performance assessment, operating energy, energy savings, maintenance, summary and conclusions.

31997 (DOE/R5/10140—T1) **Performance improvement of a solar heating system utilizing off-peak electric auxiliary.** Eltimsahy, A.H. (Toledo Univ., OH (USA)). Jun 1980. Contract FG02-79R510140. 101p. NTIS, PC A06/MF A01.

The design and construction of a heat pump system suitable for incorporating in a space solar heating system utilizing off-peak storage from the electric utility are described. The performance of the system is evaluated. The refrigerating capacity, heating capacity and compressor horsepower for a heat pump system using a piston type compressor are first determined. The heat pump design is also matched with the existing University of Toledo solar house heating system. The refrigerant is Freon-12 working between a condensing temperature of up to 172°F and evaporator temperature between 0°F and 75°F. The heat pump is then installed. Performance indices for the heat pump and the heating system in general are defined and generated by the on-line computer monitoring system for the 1979/80 heating season operation. Monthly and seasonal indices such as heat pump coefficient of performance, collector efficiency, percent of heating load supplied by solar energy and individual components efficiencies in general are recorded. The data collected is then analyzed and compared with previously collected data. The improvement in the performance resulting from the addition of a piston type compressor with an external motor belt drive is then evaluated. Data collected points to the potentially improved operating performance of a solar heating system utilizing off-peak storage from the electric utility. Data shows that the seasonal percent of space heating load supplied by solar is 60% and the seasonal percent cost of space heating load supplied by solar is 82% with a solar collection coefficient of performance of 4.6. Data also indicates that such a system would pay for itself in 14 years when used in Northwest Ohio.

31998 (LA—8283-PR) **Solar energy research at LASL. Progress report, April 1-September 30, 1979.** Reisfeld, S.R.; Neeper, D.A. (comps.). (Los Alamos Scientific Lab., NM (USA)). May 1980. Contract W-7405-ENG-36. 77p. NTIS, PC A05/MF A01.

Solar energy research from April 1-September 30, 1979, performed by Los Alamos Scientific Laboratory's Group Q-11 in the areas of collector R and D and active and passive systems studies, is described. Accounts are also given of the Group's technical support to the Office of Solar Applications of the Department of Energy and of technology transfer to the scientific community, building industry, and the general public. The largest effort during this reporting period involved work on the Department of Energy (DOE) Passive Design Handbook. Other work in passive systems included a study of natural heat distribution mechanisms, further investigation of passive test rooms with special attention to the comparison between a room configured with a window-box collector and an adjoining direct-gain room, and computer calculations that develop a simplified method for predicting the behavior of an attached greenhouse. This method has been developed for direct-gain and storage-wall buildings. Research on solar collectors concerned testing the performance of both liquid and air heaters. The two-axis tracking collector test station is near completion and, with its high-temperature test loop, will permit testing of evacuated tube collectors from 200 to 500°F. Data were collected on two of our active systems buildings, the National Security and Resources Study Center and the Nambe Community Building.Guidance was provided for DOE in funding actions for more than $500K in contract renewals and new projects as part of the technical support for collector R and D. The Q-11 Group Leader provided direct assistance at DOE Headquarters during a staff shortage from January-July. In addition to monitoring 75 collector research contracts, review meetings were established on both evacuated collectors and salt gradient solar ponds.

31999 (LA-UR—80-1913) **Passive incentive requirements: a regional assessment.** Ben-David, S.; Kirschner, C.; Noll, S.A.; Roach, F. (New Mexico Univ., Albuquerque (USA). Dept. of Economics; Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 6p. (CONF-800828—2). NTIS, PC A02/MF A01.

From Solwest; Vancouver, British Columbia, Canada (6 Aug 1980).

The nation's goal of 20% solar contribution by the turn of the century will be achieved, in part, by the construction of residences heated by virtue of their passive solar designs. These designs are not economically competitive against all conventional fuels in all locations. Some degree of government incentive will be required to assure a competitive position for these designs. A methodology is presented which is used to assess the magnitude of the government incentive required to assure feasibility. The methodology is used to provide a regional assessment for the Pacific Northwest under alternative home ownership periods and conventional fuel types.

32000 (LA-UR—80-1914) **Interregional comparisons of the cost of conserving conventional fuels.** Kirschner, C.; Brunton, D.; Ben-David, S.; Roach, F. (New Mexico Univ., Albuquerque (USA); Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 37p. (CONF-800697—1). NTIS, PC A03/MF A01.

From Western Economic Association annual meeting; San Diego, CA, USA (Jun 1980).

The EASE-II simulation shows there are dramatic differences in interregional cost structures of solar energy. These differences arise from two principle sources; variations in climate and differing conventional fuel prices. Climatic conditions affect the actual production of usable heat while fuel prices determine the value of that heat. The LASL/UNM code is currently being expanded to include a green-house option. The significance of the greenhouse solar system is its ability to be retrofitted to existing homes. Each of the six present passive system types require integration into the basic structure of the house. Since new homes constitute a small part of residential energy consumption the potential for real impact on the national energy picture by solar will have to come from retrofit.

Another addition to the code is in the area of combined application of solar and insulation. Currently solar performance is compared to a standard insulation home. Given the opportunity to use both solar and insulation to conserve fuel, the optimum generally calls for some mix of the two. Shadow prices emerge on solar and insulation as increasing the level of one entails an opportunity cost of foregoing some application of the other. The addition of these features are expected to enhance the value of the LASL/UNM code as a policy analysis tool.

32001 (LBL—9292(Rev.)) **Simulation model for the performance analysis of roof pond systems for heating and cooling.** Tavana, M.; Kammerud, R.; Akbari, H.; Borgers, T. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.; Abadan Inst. of Tech. (Iran); California State Univ., Humboldt, Arcata (USA). Dept. of Chemistry). Jun 1980. Contract W-7405-ENG-48. 8p. (CONF-800604—34(Rev.)). NTIS, PC A02/MF A01.

From American section of the International Solar Energy Society conference; Phoenix, AZ, USA (2 Jun 1980).

A detailed computer model has been developed for simulating the dynamic thermal behavior of roof pond systems. The model is composed of outer movable insulation, an optional evaporative water layer over water bags on steel decking, and an inner movable insulation. A control strategy for the movable insulations which provides near optimum thermal performance is included in the model. An hourly thermal balance analysis of the system is performed using theoretical and/or empirical expressions to determine the heat transfer coefficients for each of the surfaces in the model. The model has been used to study the effect on system thermal performance of [1] the R-value of both the top and bottom movable insulations; [2] the depth of the pond water, and [3] the depth of the evaporative layer. The heating and cooling potentials of the roof pond have also been investigated in four climates. The model was developed for incorporation into the public domain building energy analysis computer program BLAST.

32002 (LBL—10033) **Thermosiphon water heaters with heat exchangers.** Mertol, A.; Place, W.; Webster, T.; Greif, R. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Jun 1980. Contract W-7405-ENG-48. 11p. (CONF-800604—33). NTIS, PC A02/MF A01.

From American section of the International Solar Energy Society conference; Phoenix, AZ, USA (2 Jun 1980).

An analytical Detailed Loop Model (DLM) has been developed to analyze the performance of solar thermosiphon water heaters with heat exchangers in storage tanks. The model has been used to study performance of thermosiphons as a function of heat exchanger characteristics, heat transfer fluids, flow resistances, tank stratification, and tank elevation relative to the collector. The results indicate that reasonable performance can be attained with these systems compared to thermosiphons without heat exchangers.

32003 (LBL—10257) **Buoyancy-driven convection in a rectangular enclosure: experimental results and numerical calculations.** Bauman, F.; Gadgil, A.; Kammerud, R.; Greif, R. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Jul 1980. Contract W-7405-ENG-48. 18p. (CONF-800723—22). NTIS, PC A02/MF A01.

From 19. national heat transfer conference; Orlando, FL, USA (27 Jul 1980).

Within the building sciences, little attention has been given to buoyancy-driven convection in room geometries at the large Rayleigh numbers which typify full-scale structures. Natural convective heat transfer processes are fundamental to the operation of many passive solar systems. In order to fully understand system performance and to allow design optimization, the characteristics of this heat transfer process must be examined from first principles. For this reason, an investigation of two- and three-dimensional buoyancy-driven convection in rectangular enclosures at Rayleigh numbers approaching 10^{10} has been initiated at Lawrence Berkeley Laboratory. The technical details of the experimental analysis performed to date and the comparison of the numerical results with published data are discussed. Initial results are also presented from the application of the convection analysis computer program to simulate convective heat transfer arising from a few representative room surface temperature distributions.

32004 (P—104-80-001) **Residential space heating: solar and electric resistance systems cost and performance data.** Hutchcraft, T. (California Energy Commission, Sacramento (USA)). Apr 1980. 109p. California Energy Commission, Sacramento.

Cost and performance data on new residential space heating systems, specifically, active and passive solar systems and electric resistance systems, are presented. The majority of the information presented was obtained from 21 documents, which are listed. Information sheets include the project name, location, dwelling size and type, solar system type, cost, performance, and system description. The data were collected to assist with the Residential Building Standards Revision Project. (WHK)

32005 (SERI/RR—721-377) **Statistical problems in design technique validation.** Cohen, J.S. (Solar Energy Research Inst., Golden, CO (USA)). Apr 1980. Contract AC02-77CH00178. 36p. NTIS, PC A03/MF A01.

This work is concerned with the statistical validation process for measuring the accuracy of design techniques for solar energy systems. This includes a discussion of the statistical variability inherent in the design and measurement processes and the way in which this variability can dictate the choice of experimental design, choice of data, accuracy of the results, and choice of questions that can be reliably answered in such a study. The approach here is primarily concerned with design procedure validation in the context of the realistic process of system desig, where the discrepancy between measured and predicted results is due to limitations in the mathematical models employed by the procedures and the inaccuracies of input data. A set of guidelines for successful validation methodologies is discussed, and a simplified validation methodology for domestic hot water heaters is presented.

32006 (SERI/TR—0924-1) **Performance data for passive systems. A proposed data format.** (Bickle/CM, Inc., Albuquerque, NM (USA)). Jun 1980. Contract AC02-77CH00178. 51p. NTIS, PC A04/MF A01.

A program for the collection and reduction of passive solar experimental data is described. The following are included: set of significant variables, the standard data format, and generic types and data sources. Included in appendices are: proposed IEA format for reporting data on solar heated buildings, sample report of Swedish passive solar building using IEA format, and selected sources of experimental data on passive solar structures. (MHR)

32007 (SERI/TR—0924-2) **Performance data for passive systems. The Los Alamos Scientific Laboratory test rooms.** (Bickle/CM, Inc., Albuquerque, NM (USA); Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract AC02-77CH00178. 24p. NTIS, PC A02/MF A01.

Direct gain and Trombe wall test cells were constructed for use in assessing the performance of such systems and to provide data for the validation of a computer model. The environment, building, passive solar system, and data acquisition system are described for each cell. Graphs and tables of weather and validation variables are included. (MHR)

32008 (SERI/TR—0924-3) **Performance data for passive systems. The National Center for Appropriate Technology.** (Bickle/CM, Inc., Albuquerque, NM (USA); National Center for Appropriate Technology, Butte, MT (USA)). Jun 1980. Contract AC02-77CH00178. 34p. NTIS, PC A03/MF A01.

Direct gain and Trombe wall test cells were constructed at the National Center for Appropriate Technology to assess the performance of such systems and provide data for the validation of a computer model. The environmental, building, passive solar system, data acquisition system, and system thermal performance are described. (MHR)

32009 (SERI/TR—0924-4) **Performance data for passive systems: the Balcomb House.** (Bickle/CM, Inc., Albuquerque, NM (USA)). Jun 1980. Contract AC02-77CH00178. 27p. NTIS, PC A03/MF A01.

The Balcomb House, utilizing sunspace and mass storage wall, has been constructed in Santa Fe, New Mexico and is being monitored by the Los Alamos Scientific Laboratory. This has been used to assess the performance of such systems during actual occupancy conditions and provide data for the validation of a computer model. The environment, building, passive solar system, data acquisition system, and thermal performance are described. (MHR)

32010 (SERI/TR—0924-5) **Performance data for passive systems. The Ralph Williamson house.** (Bickle/CM, Inc., Albuquerque, NM (USA)). Jun 1980. Contract AC02-77CH00178. 36p. NTIS, PC A03/MF A01.

This house uses direct gains on the massive floor and walls. In addition to a large expanse of south facing windows is a large clerestory. The environment, building, passive solar system, data acquisition system, and thermal performance are described. (MHR)

32011 (SERI/TR—0924-6) **Performance data for passive systems: the Bruce Hunn House.** (Bickle/CM, Inc., Albuquerque, NM (USA)). Jun 1980. Contract AC02-77CH00178. 36p. NTIS, PC A03/MF A01.

This 1955 ft^2 house uses a Trombe wall for space heating as well as direct gain. A rock bed storage box which is actively charged has not operated satisfactorily yet. The house, the environment, the solar system, and the data acquisition system are described. Annual and hourly test data for the house are presented. (MHR)

32012 (SERI/TR—0924-7) **Performance data for passive systems. The University of Nebraska test rooms.** (Bickle/CM, Inc.,

Albuquerque, NM (USA)). Jun 1980. Contract AC02-77CH00178. 25p. NTIS, PC A02/MF A01.

Performance results from monitored direct gain and Trombe wall test rooms are presented. The environment, building, passive solar system, and data acquisition systems are described. (MHR)

32013 (SERI/TR—0924-8) **Performance data for passive systems. The Charless Fowlkes house.** (Bickle/CM, Inc., Albuquerque, NM (USA)). Jun 1980. Contract AC02-77CH00178. 38p. NTIS, PC A03/MF A01.

The Fowlkes House, utilizing a water tube storage wall, has been constructed in Bozeman, Montana and was monitored by the owner, Dr. Charless W. Fowlkes. This data and experience has been used to assess the performance of such systems during actual occupancy conditions. The information obtained has proven extremely useful in determining design parameters within the Montana area. In a period lasting from 1976 to 1977, Dr. Fowlkes designed and built this indirect gain passive solar home. The house, passive solar system, data acquisition system, and performance data are described. (WHK)

32014 (SERI/TR—0924-9) **Performance data for passive systems: the Maeda/Nittler Suncatcher house.** (Bickle/CM, Inc., Albuquerque, NM (USA)). Jun 1980. Contract AC02-77CH00178. 34p. NTIS, PC A03/MF A01.

The Suncatcher passive solar design, utilizing direct gain and mass storage, was constructed in Davis, California and has been monitored by Davis Alternative Technology Associates (D.A.T.A.). The purpose of this project was to study and monitor this innovated passive solar design and provide detailed, quantitive data on the performance of the Suncatcher sun reflector design. An additional purpose of this project was to compare the houses' thermal performance to a computer simulation program SOLSIM. Performance has also been compared to two design evaluation programs, SOLEST, which estimates energy performance, solar contribution, and natural cooling and LASL6 which uses Doug Balcomb's passive solar load ratio estimating techniques. The system is described and performance data are presented and discussed. (WHK)

32015 (SERI/TR—981502(Vol.2)) **Comparison of solar heat pump systems to conventional methods for residental heating, cooling, and water heating. Final report.** Hughes, P.J.; Morehouse, J.H. (Science Applications, Inc., McLean, VA (USA)). Apr 1980. Contract AC02-77CH00178. 249p. NTIS PC A11/MF A01.

Results of analysis of series and parallel configured solar heat pump systems for residences are presented. The year-round thermal performance for all the heating, cooling, and hot water system configurations were determined by simulation and compared against conventional heating and cooling systems in several geographic locations. The series and parallel combined solar heat pump systems investigated are at best marginally competitive, on a 20-year life-cycle cost basis, with conventional oil and electric furnace systems. The combined solar heat pump systems are not economically competitive with conventional gas furnace or stand-alone heat pump systems for residential space heating, cooling and water heating. The combined solar heat pump systems do offer the potential for significant energy savings as compared to conventional furnace systems and the stand-alone heat pump. The cost of that savings, however, is beyond that which the average consumer can be expected to pay. It appears unlikely that during the next five years any of the combined solar heat pump systems studied here will be installed for purely economic reasons. Further development of parallel and series combined solar heat pump systems should no longer be pursued, unless justified by policy level or other noneconomic factors.

32016 (SERI/TR—98150-2(Vol.1)(Exect.Summ.)) **Comparison of solar heat pump systems to conventional methods for residential heating, cooling, and water heating.** Hughes, P.J.; Morehouse, J.H. (Science Applications, Inc., McLean, VA (USA)). Apr 1980. Contract AC02-77CH00178. 35p. NTIS, PC A03/MF A01.

This study performed an analysis of series and parallel configured solar heat pump systems for residences. The year-round thermal performance for all the heating, cooling, and hot water system configurations were determined by simulation and compared against conventional heating and cooling systems in several geographic locations. The series and parallel combined solar heat pump systems investigated are at best marginally competitive, on a 20-year life-cycle cost basis, with conventional oil and electric furnace systems. The combined solar heat pump systems are not economically competitive with conventional gas furnace or stand-alone heat pump systems for residential space heating, cooling and water heating. The combined solar heat pump systems do offer the potential for significant energy savings as compared to conventional furnace systems and the stand-alone heat pump. The cost of that savings, however, is beyond that which the average consumer can be expected to pay. It appears unlikely that during the next five years any of the combined solar heat pump systems studied here will be installed for purely economic reasons. Further development of parallel and series combined solar heat pump systems should no longer be pursued, unless justified by policy level or other noneconomic factors. This volume contains the executive summary.

32017 (SERI/TR—98150-2(Vol.3)(App.)) **Comparison of solar heat pump systems to conventional methods for residential heating, cooling, and water heating.** Hughes, P.J.; Morehouse, J.H. (Science Applications, Inc., McLean, VA (USA)). Apr 1980. Contract AC02-77CH001. 228p. NTIS, PC A11/MF A01.

These Appendices are one of two companion volumes to Volume II of this series, Comparison of Solar Heat Pump Systems to Conventional Methods for Residential Heating, Cooling, and Water Heating. That report summarizes a study of residential-size solar-assisted heat pump systems. The objectives of the study were (1) to develop a consistent framework for comparing the performance of parallel and series configuration systems against competing conventional systems, and (2) to perform thermal and economic analyses. The analysis framework described in the report forms the startng point of a standard methodology for comparative systems studies that SERI is developing in conjunction with Science Applications, Inc. The comparative analysis of series and parallel solar-assisted heat pump systems that was performed within this framework indicates that these system configurations are neither economically competitive with conventional stand-alone heat pump systems now, nor will they be so in the future. The conclusion indicates that solar-assisted heat pumps are not an economically viable alternative for residential heating and cooling applications. Appendices include (A) detailed housing descriptions; (B) simple load model parameters, inputs, outputs, and heat generation file format; (C) heat pump model inputs, parameters, and outputs; (D) system level simulation parameters; (E) system specific cost estimates of component equipment; (F) stand-alone heat pump system; (G) liquid parallel system; (H) air parallel system; (I) liquid series system; and (J) air series system. (WHK)

32018 **Solar gain: winners of the passive solar design competition.** Sacramento, CA; California Energy Commission (1980). 118p. (NP—25015).

The California Passive Solar Design Competition was held to encourage the design and construction of single- and multi-family homes that incorporate passive solar heating and cooling and are moderate in cost. To enter the competition, architects or designers familiar with the fundamentals of passive solar heating and natural ventilation had to join with a builder and submit a design that could be easily adapted to commercial construction techniques and that would appeal to California homebuyers. The purpose and rules of the competition were spelled out in 1978 in Assembly Bill 3046, authored by Assemblyman Herschel Rosenthal (D-Los Angeles). The legislation specified that the California Energy Commission conduct this competition with the cooperation of the Office of the State Architect. Under contract to the California Energy Commission, the Governor's Office of Appropriate Technology managed the competition and published this portfolio. The first chapter of this portfolio reviews the competition rules and the judging, evaluation, and selection of the winning designs. Chapter Two explains the thermal performance and economic analysis used in evaluating the entries. Descriptions of the winning designs, with cross sections and construction details, follow in Chapter Three. Among the entries that did not receive awards, there were some notable concepts. These are detailed in Chapter Four. Chapter Five is a guide to passive solar heating and natural ventilation, followed by sources for further information, a glossary, and a bibliography.

32019 **In-floor distribution and storage of solar heat in a swine growing-finishing unit.** Bodman, G.R.; Schulte, D.D.; DeShazer, J.A. (Univ of Nebr, Lincoln). *ASAE Tech. Pap.;* 14p, Paper 75-4525(1979).

From Winter meeting of ASAE; New Orleans, LA, USA (11 Dec 1979).

Efficient utilization of solar energy requires development of systems for collection, distribution, storage, and use of solar heat. Details are presented regarding the design of an in-floor heat distribution system and a floor/soil mass heat storage for a modified-open-front swine growing-finishing unit. Instrumentation, materials and construction techniques are outlined. Data are presented on building response to the solar heat system. Refs.

32020 (COO—4512-1) **To develop a dynamic model of a collector loop for purpose of improved control of solar heating and cooling. Final technical report.** Herczfeld, P.R.; Fischl, R. (Drexel Univ., Philadelphia, PA (USA)). [nd]. Contract EG-77-S-02-4512. 187p. NTIS, PC A09/MF A01.

The program objectives were to (1) assess the feasibility of using the TRNSYS computer code for solar heating and cooling control studies and modify it wherever possible, and (2) develop a new dynamic model of the solar collector which reflects the performance of the collector under transient conditions. Also, the sensitivity of the performance of this model to the various system parameters such as collector time constants, flow rates, turn-on and turn-off temperature set points, solar insolation, etc., was studied. Results are presented and discussed. (WHK)

32021 (COO—4519-1) **Optimal control studies of solar heating systems.** Winn, C.B. (Colorado State Univ., Fort Collins (USA). Dept. of Mechanical Engineering). [nd]. Contract AS02-77CS34519. 117p. NTIS, PC A06/MF A01.

In the past few years fuel prices have seen steady increases. Also, the supply of fuel has been on the decline. Because of these two problems there has been an increase in the number of solar heated buildings. Since conventional fuel prices are increasing and as a solar heating system represents a high capital cost it is desirable to obtain the maximum performance from a solar heating system. The control scheme that is used in a solar heated building has an effect on the performance of the solar system. The best control scheme possible would, of course, be desired. This report deals with the control problems of a solar heated building. The first of these problems is to control the inside temperature of the building and to minimize the fuel consumption. This problem applies to both solar and conventionally heated buildings. The second problem considered is to control the collector fluid flow to maximize the difference between the useful energy collected and the energy required to pump the fluid. The third problem is to control the enclosure temperature of a building which has two sources of heat, one solar and the other conventional.

AGRICULTURAL AND INDUSTRIAL PROCESS HEAT

32022 (CONF-791239—, pp 41-55) **Solar watering heating at the Iris Images Film Processing Laboratory.** Sartor, D. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This system uses 640 ft^2 of site-fabricated liquid flat plate collectors and a 360 gallon storage tank for photographic process water heating. The installed cost of the system was approximately $25 per square foot of collector area but the collector is relatively inefficient. The problems encountered involving a freeze coupled to a power failure are detailed. Other problems are listed. (MHR)

32023 (COO—4879-T1) **Programmatic environmental assessment of the DOE Solar Agricultural and Industrial Process Heat Program.** (Energy and Environmental Analysis, Inc., Arlington, VA (USA)). Jun 1979. Contract ET-78-C-02-4879. 223p. NTIS, PC A11/MF A01.

The program's potential environmental impacts are evaluated to ensure that environmental issues are considered at the earliest meaningful point in the decision-making process. The existing environment is studied for the following: grain drying; crop drying; livestock shelter heating; food processing; textile products; lumber and wood products; paper products; chemicals; petroleum refining; stone, clay, and glass products; and primary metals industries. Environmental impacts of the proposed action on the following are studied: air quality, water quality, ecosystems, health and safety, land use, esthetics, and social and institutional impacts. (MHR)

32024 (DOE/SF/10735—1) **Solar central receiver reformer system for ammonia plants. Final technical report.** (PFR Engineering Systems, Inc., Marina Del Rey, CA (USA)). Jul 1980. Contract AC03-79SF10735. 450p. NTIS, PC A11/MF A01.

Details of the conceptual design, economic analysis, and development plan for a solar central receiver system for retrofitting the Valley Nitrogen Producers, Inc., El Centro, California 600 ST/SD Ammonia Plant are presented. The retrofit system consists of a solar central receiver reformer (SCRR) operating in parallel with the existing fossil fired reformer. Steam and hydrocarbon react in the catalyst filled tubes of the inner cavity receiver to form a hydrogen rich mixture which is the syngas feed for the ammonia production. The SCRR system will displace natural gas presently used in the fossil reformer combustion chamber. The solar reformer retrofit system characteristics and its interface with the existing plant are simple, incorporating state-of-the-art components with proven technology. A northfield composed of one thousand forty (1040) second generation heliostats provides solar energy to the receiver which is positioned on top of a 90 meter high steel tower. The overall economics of this system can provide over 20% discount cash flow rate of return with proper investment and market conditions. Drawings and cost and performance data are included. (WHK)

32025 (DOE/SF/10735—1(Exect.Summ.)) **Solar central receiver reformer system for ammonia plants. Final report.** (PFR Engineering Systems, Inc., Marina Del Rey, CA (USA)). Jul 1980. Contract AC03-79SF10735. 66p. NTIS, PC A04/MF A01.

This executive summary presents an overview of a study to retrofit the Valley Nitrogen Producers, Inc. El Centro, California 600 ST/SD Ammonia Plant with Solar Central Receiver Technology. The retrofit system consists of a solar central receiver reformer (SCRR) operating in parallel with the existing fossil fired reformer. Steam and hydrocarbon react in the catalyst filled tubes of the inner cavity receiver to form a hydrogen rich mixture which is the syngas feed for the ammonia production. The SCRR system will displace natural gas presently used in the fossil reformer combustion chamber. (WHK)

32026 (SERI/TR—632-385) **Preliminary operational results of the low-temperature solar industrial process heat field tests.** Kutscher, C.F.; Davenport, R.L. (Solar Energy Research Inst., Golden, CO (USA)). Jun 1980. Contract AC02-77CH00178. 40p. NTIS, PC A03/MF A01.

Six solar industrial process heat field tests have been in operation for a year or more - three are hot water systems and three are hot air systems. All are low-temperature projects (process heat at temperatures below 212°F). Performance results gathered by each contractor's data acquisition system are presented and project costs and problems encountered are summarized. Flat-plate, evacuated-tube, and line-focus collectors are all represented in the program, with collector array areas ranging from 2500 to 21,000 ft^2. Collector array efficiencies ranged from 12% to 36% with net system efficiencies from 8% to 33%. Low efficiencies are attributable in some cases to high thermal losses and, for the two projects using air collectors, are due in part to high parasitic power consumption. Problems have included industrial effluents on collectors, glazing and absorber surface failures, excessive thermal losses, freezing and overheating, control problems, and data acquisition system failure. With design and data acquisition costs excluded costs of the projects ranged from $25/$ft^2$ to $87/$ft^2$ and $499/(MBtu/yr) to $1537/(MBtu/yr).

32027 **Solar heating: experience in the milking parlor.** Thompson, P.D.; Hayden, M.B.; Carson, D.E. (Dairy Equip Co, Madison, Wis). *ASAE Tech. Pap.;* 21p, Paper 79-35536(1979).

From Winter meeting of ASAE; New Orleans, LA, USA (11 Dec 1979).

During 1979 a solar heating system for the production of both hot water and space heat was operated continuously at the USDA's Beltsville Agricultural Research Center. This system is the evolutionary product of four years of applied research during which various combinations of solar collectors, heating loads, interconnecting piping and control systems were tested. The system, in its final configuration, uses flat plate solar collectors having copper absorbers and a single glazing. Approximately 90 m^2 of collector area is provided. Primary energy storage is provided by closed loop recirculation of hot water produced by the solar collectors to a 15000 l glass fiber reinforced plastic water storage tank, insulated on the sides and top, and resting on a 30 cm slab of insulating concrete within an underground vault.

WATER HEATING

REFER ALSO TO CITATION(S) 31775, 31776, 31777, 31786, 31843, 31888, 31890, 31894, 31895, 31896, 31897, 31898, 31900, 31904, 31905, 31910, 31915, 31916, 31917, 31918, 31919, 31921, 31925, 31929, 31930, 31932, 31933, 31935, 31936, 31938, 31940, 31941, 31942, 31944, 31946, 31947, 31951, 31952, 31955, 31959, 31962, 31965, 31966, 31967, 31968, 31969, 31970, 31972, 31977, 31990, 31991, 31992, 31993, 31994, 31996, 32005, 32015, 32016, 32017, 32060

32028 (CONF-791239—, pp 75-102) **Woodlands Solar Project.** May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The Woodlands Inn has 242 units, conference center, and complete facilities. A domestic hot water and pool heating system is described using 10,260 ft^2 of liquid flat-plate collectors and 10,050-gallon lined steel tanks for storage. (MHR)

32029 (CONF-791239—, pp 123-133) **Days Inns: solar and energy conservation systems.** Grissett, J.A. Jr. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The Days Inn experience in solar and energy conservation systems is reviewed briefly. The energy conservation methods are listed and the experience with a solar water heating system in South Carolina is described. Current solar proects under construction and future proposed projects are mentioned. (MHR)

32030 (CONF-791239—, pp 247-252) **Woodstock Resort Corp. solar hot water program.** Brown, D.G. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This project includes two major solar arrays totaling 240 Revere tube-in-strip double glazed solar collector panels, located over an existing parking area and affording some weather protection for the vehicles parked below. The system was first put into operation in October 1978 at a total cost of $276,389.00. It is thought that the goal of obtaining more than 70% of the daily domestic hot water needs has been met. (MHR)

32031 (CONF-791239—, pp 313-319) **SAGE water heating systems.** Rice, J.F.; Bartera, R.E. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979)

The El Toro system provides solar-heated domestic hot water for two buildings containing 32 apartment buildings. The system uses 1008 ft² of flat-plate collector and 1280 gallons of storage. The measured performance of the El Toro system is presented. (MHR)

32032 (CONF-791239—, pp 515-521) **Ingham County Medical Care Facility solar water heating system.** Zapp, H.R. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The procedure is described for the design, construction, and maintenance of a large solar water heating system installed in the Ingham County Medical Care Facility (Geriatric). In addition some information on performance is presented since this site has only been in operation for a short period of time. Indications to date show that the solar system operates extremely well, was installed, using the highest quality material and workmanship, and has focused positive public interest on solar energy. Factors limiting performance are discussed and some recommendations for improving the performance provided. The Ingham County Solar System consists of 504 Revere tube-in-strip double glazed copper collectors which are distributed in 14 rows of 36 collectors. The collectors are mounted on supports in the field at an elevation of 42° (approximate latitude of Lansing, Mich.) and 10° east of South. The collector system heat transfer fluid, low-toxicity propylene glycol without inhibitors, flows at 100 gpm when the system is enabled by a differential temperature controller. Solar collected energy is transferred to a 5000 gallon insulated storage tank by an insulated shell-in-tube heat exchanger providing one wall of water-glycol isolation for water used in laundry applications. A second heat exchanger draws energy from the 5000 gallon tank to preheat the potable water providing a second water-glycol wall to the non-laundry hot water demand. Earlier computer simulations predicted a yearly collection of $2x10^9$ Btu which corresponds approximately 25% of the estimated hot water load.

32033 (CONF-791239—, pp 577-587) **Evaluation of freeze protection systems for a large scale solar energy system.** Gunardson, H.H. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

The results of a comparative evaluation between a water drain-down freeze protection system and several anti-freeze configurations for a large solar energy installation supplying primarily domestic hot water are presented. A description of the project is followed by a discussion of the basis used for the evaluation. The basis for evaluation gives the constants, variables and key comparisons used to assess overall system performance and cost effectiveness. The rationale used to select various heat transfer fluids is given along with a discussion on the implications of varying the mass flow rate of the fluid in the collector loop. The result of this study indicates a strong economic advantage in favor of the water drain-down freeze protection system for a domestic hot water system installed in a northern climate. Some general conclusions are drawn from this result and recommendations for minimizing the risk of freeze-up with a water drain-down system are offered.

32034 (CONF-791239—, pp 593-595) **Solar hot water system for the Coachlight Motel in Las Cruces, New Mexico.** Cooper, T.J. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic system uses 1075 ft² of selectively coated, evacuated flat-plate collectors and three 350 gallon capacity storage tanks. Temperatures attained and maintained, operations, problems encountered, cost of maintenance, and lessons learned are briefly described for the seventeen months of solar performance. (MHR)

32035 (CONF-791239—, pp 711-714) **Update performance of the solar water heating systems on the Econo-Travel motor hotels.** Allen, L.; Allred, J. May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar water heating system uses 1024 ft² of flat-plate collectors and 1500 gallons of thermal storage. Design features and operating experiences are reviewed. (MHR)

32036 (CONF-791239—, pp 717-719) **Bethany College solar installation.** May 1980.

From 3. solar heating and cooling demonstration program contractors review meeting; Norfolk, VA, USA (16 Dec 1979).

This active hydronic solar space and water heating system uses 4512 ft² of flat-plate collectors and a 6500 gallon steel tank for heat storage. The system is designed to supply heat and domestic hot water to a proposed dining hall and domestic hot water for an existing conference center and a 40-unit motel. Some operating experience since March 1979 is reviewed. (MHR)

32037 (DOE/NASA/CR—161492) **Solar Energy System Economic Evaluation. Final report for Elam-Tempe, Tempe, Arizona and Elcam-San Diego, San Diego, California.** (IBM Federal Systems Div., Huntsville, AL (USA)). Jun 1980. Contract AI01-76CS31037. 103p. NTIS, PC A06/MF A01.

The economic analysis of the solar energy systems that were installed at Tempe, Arizona and San Diego, California, is developed for these and four other sites typical of a wide range of environmental and economic conditions in the continental United States. This analysis is accomplished based on the technical and economic models in the f-Chart design procedure with inputs based on the characteristics of the installed system and local conditions. The results are expressed in terms of the economic parameters of present worth of system cost over a projected twenty year life: life cycle savings, year of positive savings and year of payback for the optimized solar energy system at each of the analysis sites. The sensitivity of the economic evaluation to uncertainties in constituent system and economic variables is also investigated. The results demonstrate that the solar energy system is economically viable at all of the sites for which the analysis was conducted.

32038 (DOE/NASA/CR—161510) **Solar Energy System Economic Evaluation. Final report for IBM System 2, Togus, Maine.** (IBM Federal Systems Div., Huntsville, AL (USA)). Jul 1980. Contract AI01-76CS31037. 95p. NTIS, PC A05/MF A01.

The economic analysis of the solar energy system that was installed at Togus, Maine Operational Test Site (OTS), is developed for Togus and four other sites typical of a wide range of environmental and economic conditions in the continental United States. This analysis is accomplished based on the technical and economic models in the f-Chart design procedure with inputs taken on the characteristics of the installed system and local conditions. The results are expressed in terms of the economic parameters of present worth of system cost over a projected twenty year life, life cycle savings, year of positive savings and year of payback for the optimized solar energy system at each of the analysis sites. The sensitivity of the economic evaluation to uncertainties in constituent system and economic variables is also investigated. The results demonstrate that the solar energy system is economically viable at all of the five sites for which the analysis was conducted.

32039 (P—104-79-005) **Sacramento area, solar domestic water heater installers survey report.** Hutchcraft, T. (California Energy Commission, Sacramento (USA)). Nov 1979. 47p. California Energy Commission, Sacramento.

Information regarding generic type, make, and costs of solar domestic water heater (SDWH) systems in the Sacramento, Roseville, and Davis area is reported. Sixteen SDWH installers/do-it-yourself kit dealers were identified and surveyed by phone. The survey participants were divided into three categories: (1) installers in business for one year or longer, (eight firms); (2) installers in business less than one year, (five firms); and (3) SDWH do-it-yourself kit dealers, (three firms). The survey report establishes an average cost for SDWH pump systems for new single family unit production housing (1350 square feet), with hot water demand typical of an average family of four, and roof mounted collectors. For the first two categories, the SDWH system average cost is $2469 (this includes both open loop and heat exchanger systems with circulating pumps). The average cost of the open loop pump system is $2321; whereas, the heat exchanger pump system average cost is $2592. The participants were questioned concerning discounts they would offer to builders purchasing SDWH's in volume. From their responses, an 11% discount for a purchase of ten systems was derived for the first two installers categories. The average cost of an installed SDWH pump system purchased in a volume of ten units is $2201. The average cost of an installed SDWH open loop system is $2066, and a heat exchanger system is $2307. For the third category, the do-it-yourself kit dealers, a 12% discount was derived for a purchase of ten systems. The average cost of a do-it-yourself pump kit when purchased in a volume of ten units is $1481. The average cost of an open loop pump kit is $1386, and a heat exchanger pump kit is $1672.

32040 (P—500-79-015) **Comparative study of solar domestic hot water systems in California. Consultant report.** Bergquam, J.; Young, M.; Perry, S.; Baughn, J. (California State Univ., Sacramento (USA). Dept. of Mechanical Engineering; California Univ., Davis (USA). Dept. of Mechanical Engineering). Nov 1979. 144p. California Energy Commission, Sacramento.

The results of a comparative study of five different solar domestic hot water systems are presented. The study formally began in March 1978 and was completed in June 1979. Each of the five systems is described in detail and the instrumentation used for measuring and recording data is discussed. The analytical models, which were developed as part of the program, are presented. The models of each of the system components and the techniques used for determining solar radiation and ambient temperature are described. The validity of the analytical models is established by comparing experimental data and analytical calculations. Results are

presented graphically showing the comparison of measured and calculated values of collector inlet and outlet temperatures and cumulaive auxiliary energy as a function of time of day for all five systems. The performances of the SDHW systems are tabulated for 14 different locations in California. With these results it is possible to compare the yearly percent solar provided by the different generic types of SDHW systems.

OTHER

REFER ALSO TO CITATION(S) 31465, 31919

SOLAR COLLECTORS AND CONCENTRATORS

REFER ALSO TO CITATION(S) 31789, 31878, 31998, 32535

32041 (ALO—4197-T2) **Development of a 10X lens concentrator. Technical status report.** Holdridge, D. (Swedlow, Inc., Garden Grove, CA (USA)). May 1979. Contract EM-78-C-04-4197. 33p. NTIS, PC A03/MF A01.

Many linear and circular lens designs were tested to verify both predicted and field test results. Analyzer test results confirm existing data on energy distribution, but yield lower lens efficiencies than expected. Approximately 15 to 20% of the energy exiting the lens is not being detected at the focal plane. It is thought that the chopped beam leaving the lens centerline and the periphery is resulting in a phase shift problem with the detector. Tests are in progress to determine and cure the test problems. Nearly all performance predictions for the three candidate lens designs were completed. These designs include: plano convex lenses; bi-convex lenses; and convex-concave lenses. (MHR)

32042 (ALO—5355-T2) **Solar collector studies for solar heating and cooling applications. Final technical report.** Anderson, J.H.; Jensen, S.O.; Kovacic, J.E. (Sperry Univac, St. Paul, MN (USA)). Jan 1980. Contract EM-78-C-04-5355. 70p. NTIS, PC A04/MF A01.

A summary of the literature, especially patent teachings pertaining to black fluid solar collectors is given. Laboratory tests to determine the suspension stability of various carbon types in water/Propylene glycol are reported. The suspensions were aged at 160°F for 3600 hours and at -15°F for 1100 hours. It is suggested that the suspending agent interacts with electrical charges on the carbon particles to prevent agglomeration. The liquid was tested for its operating characteristics with several collector design variables using glass tubes as the containment system. The collectors were installed in a house previously operated on a black liquid system, and observed for a six month period with the weather ranging from -12°F to 94°F with no major problems occurring with either the liquid or the collectors.

32043 (ALO—5364-T1) **Wind effects on collectors. Final report, October 1, 1978-October 1, 1979.** Hewitt, H.C. Jr.; Griggs, E.I. (Tennessee Technological Univ., Cookeville (USA)). 1 Nov 1979. Contract EM-78-C-04-5364. 113p. NTIS, PC A06/MF A01.

Consideration was given to modeling wind speed data and to a scheme for correlating data between two separate stations. Experimental data were also collected and compared. A sensor system was developed to measure the effect of wind on collector performance. The specifications for the sensor are presented, and a discussion of the calibration of the sensor is given. Four experiments were performed to determine wind flow patterns around buildings. The velocity profile over an actual collector was also measured as a function of free stream velocity. A water table experiment was also performed to give flow visualization around model buildings. A mathematical model for a solar collector and on three experimental efforts to measure the effect of wind on collector performance were reported. (MHR)

32044 (DOE/CS/30171—1) **Compendium of information on identification and testing of materials for plastic solar thermal collectors.** McGinniss, V.D.; Sliemers, F.A.; Landstrom, D.K.; Talbert, S.G. (Battelle Columbus Labs., OH (USA)). 31 Jul 1980. Contract AC04-79CS30171. 389p. NTIS, PC A17/MF A01.

This report is intended to organize and summarize prior and current literature concerning the weathering, aging, durability, degradation, and testing methodologies as applied to materials for plastic solar thermal collectors. Topics covered include (1) rate of aging of polymeric materials; (2) environmental factors affecting performance; (3) evaluation and prediction of service life; (4) measurement of physical and chemical properties; (5) discussion of evaluation techniques and specific instrumentation; (6) degradation reactions and mechanisms; (7) weathering of specific polymeric materials; and (8) exposure testing methodology. Major emphasis has been placed on defining the current state of the art in plastics degradation and on identifying information that can be utilized in applying appropriate and effective aging tests for use in projecting service life of plastic solar thermal collectors. This information will also be of value where polymeric components are utilized in the construction of conventional solar collectors or any application where plastic degradation and weathering are prime factors in material selection.

32045 (DOE/CS/35348—T1(Vol.1)) **Survey mirrors and lenses and their required surface accuracy. Volume 1. Technical report. Final report for September 15, 1978-December 1, 1979.** (Honeywell, Inc., Minneapolis, MN (USA). Technology Strategy Center). Jan 1980. Contract EM-78-C-04-5348. 115p. NTIS, PC A06/MF A01.

An investigation of the optical performance of a variety of concentrating solar collectors is reported. The study addresses two important issues: the accuracy of reflective or refractive surfaces required to achieve specified performance goals, and the effect of environmental exposure on the performance concentrators. To assess the importance of surface accuracy on optical performance, 11 tracking and nontracking concentrator designs were selected for detailed evaluation. Mathematical models were developed for each design and incorporated into a Monte Carlo ray trace computer program to carry out detailed calculations. Results for the 11 concentrators are presented in graphic form. The models and computer program are provided along with a user's manual. A survey data base was established on the effect of environmental exposure on the optical degradation of mirrors and lenses. Information on environmental and maintenance effects was found to be insufficient to permit specific recommendations for operating and maintenance procedures, but the available information is compiled and reported and does contain procedures that other workers have found useful.

32046 (DOE/CS/35348—T1(Vol.2)) **Survey mirrors and lenses and their required surface accuracy. Volume 2. Concentrator optical performance software (COPS) user's manual. Final report for September 15, 1978-December 1, 1979.** (Honeywell, Inc., Minneapolis, MN (USA). Technology Strategy Center). Jan 1980. Contract EM-78-C-0405348. 223p. NTIS, PC A10/MF A01.

The mathematical modeling of 11 different concentrating collectors is documented and instructions are given for use of the computer code. The 11 concentrators modeled are: faceted mirror concentration; fixed mirror, two-axis tracking receiver; parabolic trough collector; linear Fresnel; incremental reflector; inflated cylindrical concentrator; CPC-involute reflector with evacuated receiver; CPC-parabolic/involute reflector; V trough collectors, imaging collapsing concentrator; and parabolic dish collector. (MHR)

32047 (LA-UR—80-2133) **Research and development to support commercialization in solar ponds.** Meyer, K.A. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 8p. (CONF-800757—1). NTIS, PC A02/MF A01.

From Nonconvecting solar pond workshop; Washington, DC, USA (30 Jul 1980).

Solar pond technology appears promising as a source of low temperature thermal energy. Achievable temperatures range from a maximum of 100°C for unsaturated ponds up to 150°C for saturated ponds. Work to date has shown that salt-gradient ponds are feasible. Salt pond development in the US is now at a point where an in-depth analytical, numerical, and experimental program leading to an understanding of pond hydrodynamics could result in improved pond efficiencies. Without this understanding of pond hydrodynamics, ponds differing in design from those previously tested cannot be constructed with confidence that layer behavior, salt consumption, and thermal efficiency will be as planned. In addition, the practical problem of water clarity, heat extraction, maintenance, and thermal losses must be quantified. A coordinated research and development program with the necessary long-term continuity to accomplish these goals is needed.

32048 (LA-UR—80-2134) **Overview of the US program for nonconvecting solar ponds.** Neeper, D.A. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 7p. (CONF-800757—2). NTIS, PC A02/MF A01.

From Nonconvecting solar pond workshop; Washington, DC, USA (30 Jul 1980).

A brief history of research on solar ponds in the US is given; LASL's role in solar pond development is reviewed; and suggestions for future solar pond research are given. (WHK)

32049 (P—140-80-002) **Model warranty for solar energy contractors.** (California Energy Commission, Sacramento (USA)). Feb 1980. 8p. California Energy Commission, Sacramento.

Model warranties are given for a solar collector and a pool cover. These model warranties are designed for use by solar equipment manufacturers in developing warranties that will comply with the warranty requirements contained in Section 2601(e) of the Solar Tax Credit Regulations promulgated by the California Energy Commission. A manufacturer's warranty which conforms substantially with this model warranty will qualify for the state solar tax credit. Significant aspects of the model warranty are explained for solar collector manufacturers, and the principal differences between the pool cover warranty and the solar collector warranty are enumerated. It is explained how to modify the solar collector warranty so

that it may be applied to other solar and wind energy equipment. (WHK)

32050 (SAND—79-2006) **Fluid temperature control for parabolic trough solar collectors.** Schindwolf, R. (Sandia National Labs., Albuquerque, NM (USA)). Jun 1980. Contract AC04-76DP00789. 35p. NTIS, PC A03/MF A01.

Computer simulation studies of temperature control techniques for the heat transfer fluid in parabolic trough solar collector fields are discussed. In particular, it addresses the rather stringent temperature control requirements associated with thermal electric power generation or cogeneration systems. Computer models representing the fluid temperature dynamics of the collectors and interconnecting piping were developed and integrated with dynamic models of control elements to obtain a simulation of a closed loop control system. A specific control configuration was chosen consisting of a flow control valve and one or more temperature sensors to control the flow in each row of collectors. Various control algorithms were evaluated for stability and static errors, and time responses to startup transients and to partial and full collector cloud shadowing transients were obtained. The results indicated that the temperature control requirements can be satisfied using readily available components.

32051 (SAND—79-2163) **Development of a microprocessor-based sun-tracking system for solar collectors.** Kohler, S.M.; Wilcoxen, J.L. (Sandia National Labs., Albuquerque, NM (USA)). Apr 1980. Contract AC04-76DP00789. 23p. NTIS, PC A02/MF A01.

The development of a prototype sun-tracking system and the tests performed on it on an east-west trough solar collector array are described. The system includes a controller built around an RCA1802 microprocessor (μP), a digital shaft encoder, and a heat flux sensor. The heat flux sensor consists of a fine resistance wire wrapped around the receiver tube. The wire is used to correct errors in calculated tracking angles arising from reflector imperfections and misalignments.

32052 (SAND—80-0381C) **Finite element strategies for the efficient analysis and evaluation of solar collector structures.** Koteras, J.R. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 11p. (CONF-800925—1). NTIS, PC A02/MF A01.

From 1. Chautauqua on finite element modeling and MSC/nastran; Cape Cod, MA, USA (15 Sep 1980).

Concentrating or reflecting structures for solar energy systems must be evaluated as to their structural integrity and optical performance. Computer studies can be used as an integral part of these evaluations. The computer studies make use of finite element structural codes coupled with post-processors that calculate optical data. If the analysis of a solar structure is to be carried out in an efficient manner, these computer codes must have certain capabilities. A number of solar energy projects at Sandia National Laboratories have made extensive use of finite element analyses. The analyses have been useful in evaluating design concepts which hold promise for large scale use in solar energy projects. Analysis procedures have been developed for some structures so that evaluations can be carried out in a straightforward manner.

32053 **Concentrating collectors.** Rabl, A. (Solar Energy Research Inst., Golden, CO). pp 257-343 of Solar energy technology handbook. Part A. Engineering fundamentals. Dickinson, W.C.; Cheremisinoff, P.N. (eds.). New York, NY; Marcel Dekker, Inc. (1980).

The optics of solar concentrators are reviewed. Optical properties of several types of concentrators, including compound parabolic, V-trough, parabolic and fresnel lens concentrators, are discussed. The optical efficiency and u-value for a concentrator are defined. Heat loss and methods of reducing it in solar concentrators are discussed. Practical considerations which limit the performance of concentrators are mentioned. These include materials properties, dust, snow and wind (environmental properties), tracking and mirror errors, gaps between reflector and absorber, and properties of heat transfer fluids. Measurements for testing of concentrating collectors are discussed, and their performance is presented in graphical and tabular form. Cost estimates are given based on current technology. (SPH)

32054 **Standard procedures for collector performance testing.** Hill, J.E. (National Bureau of Standards, Washington, DC). pp 457-480 of Solar energy technology handbook. Part A. Engineering fundamentals. Dickinson, W.C.; Cheremisinoff, P.N. (eds.). New York, NY; Marcel Dekker, Inc. (1980).

The testing standards required to determine the thermal performance of solar collectors are discussed. The equations governing the performance of flat plate and concentrating collectors are presented and related to methods for measuring collector efficiency. (SPH)

32055 **Performance of a solar air collector under varying conditions.** Brinsfield, R.B.; Felton, K.E. (Univ of Md, Cambridge). *ASAE Tech. Pap.;* 28p, Paper 79-4549(1979).

From Winter meeting of ASAE; New Orleans, LA, USA (11 Dec 1979).

The performance of a solar air collector for low to moderate temperature application under varying conditions is presented. Empirical equations for predicting the collector efficiency factor, electrical power usage, and pressure drop through the system as a function of air flow rate are shown. Temperature history curves as a function of distance into rock storage and air flow rate are also included. 23 refs.

32056 **Thermal performance and efficiency of a large cross-section solar collector with reflectors.** Turner, L.W.; Dale, A.C. (Univ of Ky, Lexington). *ASAE Tech. Pap.;* 21p, Paper 79-4551(1979).

From Winter meeting of ASAE; New Orleans, LA, USA (11 Dec 1979).

A flat plate solar collector with reflectors has been constructed and tested. This paper presents results of performance tests as well as the development and results of a computer model of the collector. The methodology for evaluation of efficiency and performance is described. 13 refs.

32057 **High temperature solar energy absorbing surfaces.** Schreyer, J.M.; Schmitt, C.R.; Abbatiello, L.A. US Patent Application 078,758. [nd]. 25p.

A solar collector having an improved coating is provided. The coating is a plasma-sprayed coating comprising a material having a melting point above 500°C at which it is stable and selected from the group of boron carbide, boron nitride, metals and metal oxides, nitrides, carbides, borides, and silicates. The coatings preferably have a porosity of about 15 to 25% and a thickness of less than 200 micrometers. The coatings can be provided by plasma-spraying particles having a mean diameter of about 10 to 200 micrometers.

HEAT STORAGE

REFER ALSO TO CITATION(S) 31997

32058 (COO—4704-3) **Rock bed storage with heat pump. Final report.** Remmers, H.E.; Mills, G.L. (Zia Associates, Inc., Boulder, CO (USA)). May 1979. Contract EM-78-C-02-4704. 170p. NTIS, PC A08/MF A01.

The study, Rock Bed Storage with Heat Pump, established the feasibility of mating a heat pump to a rock bed storage to effect optimal performance at the lowest cost in single family residences. The operating characteristics of off-the-shelf components of heat pump/rock bed storage systems were studied, and the results were used to formulate configurations of representative systems. These systems were modeled and subsequently analyzed using the TRNSYS computer program and a life cycle cost analysis program called LCCA. A detailed load model of a baseline house was formulated as part of the TRNSYS analysis. Results of the analysis involved the development of a technique to confine the range of heat pump/rock bed storage systems to those systems which are economical for a specific location and set of economic conditions. Additionally, the results included a comparison of the detailed load model with simple UA models such as the ASHRAE bin method. Several modifications and additions were made to the TRNSYS and LCCA computer programs during the course of the study.

32059 (DOE/AL/10891—T1, pp B.1-B.35) **Design and control tradeoffs for rockbins in passively solar heated houses with high solar fractions.** Vered, G.; Sebald, A.V. (Univ. of California, San Diego, La Jolla). 1980.

In Impact of controls in passive solar heating and cooling of buildings.

Performance of active and passive rockbins are compared in Albuquerque NM, Santa Maria CA and Madison WI. The basic house is assumed to contain both Trombe wall and direct gain. The latter are assumed to be optimally sized and controlled for each weather zone. It is demonstrated that rockbins can be used to advantage in reduction of the early morning auxiliary energy consumption peak common to passive houses with night setback thermostats. Performance sensitivity to rockbin configuration (active, radiant slab top down charge, radiant slab bottom up charge), and to control strategies for charging and discharging are analyzed. Effects of fan energy are included. New results on the thermal conductivity of passive rockbins are outlined. These results are shown to be crucial to understanding the role of rockbins in passive houses.

32060 **Low-temperature sensible heat storage.** Connor, D.W. (Argonne National Lab., IL). pp 721-763 of Solar energy technology handbook. Part A. Engineering fundamentals. Dickinson, W.C.; Cheremisinoff, P.N. (eds.). New York, NY; Marcel Dekker, Inc. (1980).

A quantitative understanding of the relations between the design parameters for sensible heat storage (SHS) systems and overall solar-thermal system performance is provided. The effect of SHS stratification on space heating and domestic hot water systems is discussed. The seasonal storage space heating concept is examined, as well as the more familiar solar thermal systems. The significant factors effecting SHS heat losses are discussed and heat loss calculation are provided. A broad overview of SHS engineering requirements is presented. (SPH)

32061 **High-temperature sensible heat storage.** Turner, R.H. (Jet Propulsion Lab., Pasadena, CA). pp 765-794 of Solar energy technology handbook. Part A. Engineering fundamentals. Dickinson, W.C.; Cheremisinoff, P.N. (eds.). New York, NY; Marcel Dekker, Inc. (1980).

Thermal energy storage at temperatures in excess of 250°C is considered. Thermodynamic and economic considerations for sensible heat storage systems are discussed. Five basic sensible heat storage concepts are described in general terms. (SPH)

32062 **Thermochemical storage systems.** Mar, R.W.; Bramlette, T.T. (Sandia Lab., Livermore, CA). pp 811-839 of Solar energy technology handbook. Part A. Engineering fundamentals. Dickinson, W.C.; Cheremisinoff, P.N. New York, NY; Marcel Dekker, Inc. (1980).

The state of the art of thermochemical energy storage technologies is reviewed. Current research and development activities are summarized, problem areas are identified, and the future prospects of various chemical systems and applications are discussed. (SPH)

GEOTHERMAL ENERGY

32063 (SGP-TR—30, pp 3-4) **Recent developments in the DGE program.** Reed, M. (Division of Geothermal Energy, DOE, Washington, DC). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

The reorganization of the Division of Geothermal Energy is described briefly and an organization chart is shown. (MHR)

RESOURCE STATUS AND ASSESSMENT

32064 **Geopressured energy fighting uphill battle.** Kerr, R.A. *Science;* **207**: 1455-1456(28 Mar 1980).

Recent developments in exploration for geopressured systems reveal problems which make the outlook for profitable use less likely. The primary problem is the salinity of the water - the higher the salinity, the less methane can be dissolved. (MHR)

USA

REFER ALSO TO CITATION(S) 31843

32065 (DOE/ET/28476—9) **Geothermal energy in Idaho: site data base and development status.** McClain, D.V. (Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Utilization Center). Jul 1979. Contract AS06-77ET28476. 466p. NTIS, PC A20/MF A01.

A summary of known information about the nature of the resource, its potential for development, and the infrastructure of government which will guide future development is presented. Detailed site specific data regarding the commercialization potential of the proven, potential, and inferred geothermal resource areas in Idaho are included. Leasing and development status, institutional parameters, and a legal overview of geothermal resources in Idaho are given. (MHR)

32066 (DOE/ET/28476—T2) **Alaska: a guide to geothermal energy development.** Basescu, N.; Bloomquist, R.G.; Higbee, C.; Justus, D.; Simpson, S. (Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Utilization Center). Jun 1980. Contract AS06-77ET28476. 125p. NTIS, PC A06/MF A01.

A brief overview is given of the geological characteristics of each region of the state as they relate to potential geothermal development. Those exploration methods which can lead to the siting of a deep exploration well are described. Requirements and techniques needed for drilling deeper higher temperature exploration and production wells are presented. Electrical generation, direct utilization, and indirect utilization are reviewed. Economic factors of direct use projects are presented. A general guide to the regulatory framework affecting geothermal energy development is provided. The general steps necessary to gain access to explore, develop, distribute, and use geothermal resources are outlined. (MHR)

32067 (DOE/ET/28476—T3) **Washington: a guide to geothermal energy development.** Bloomquist, R.G.; Basescu, N.; Higbee, C.; Justus, D.; Simpson, S. (Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Utilization Center). Jun 1980. Contract AS06-77ET28476. 133p. NTIS, PC A07/MF A01.

Washington's geothermal potential is discussed. The following topics are covered: exploration, drilling, utilization, legal and institutional setting, and economic factors of direct use projects. (MHR)

32068 (DOE/ET/28476—T4) **Oregon: a guide to geothermal energy development.** Justus, D.; Basescu, N.; Bloomquist, R.G.; Higbee, C.; Simpson, S. (Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Utilization Center). Jun 1980. Contract AS06-77ET28476. 124p. NTIS, PC A06/MF A01.

A brief overview is given of the geological characteristics of each region of the state as they relate to potential geothermal development. Those exploration methods which can lead to the siting of a deep exploration well are described. Requirements and techniques needed for drilling deeper higher temperature exploration and production wells are presented. Electrical generation, direct utilization, and indirect utilization are reviewed. Economic factors of direct use projects are presented. A general guide to the regulatory framework affecting geothermal energy development is provided. The general steps necessary to gain access to explore, develop, distribute, and use geothermal resources are outlined. (MHR)

32069 (DOE/ET/28476—T5) **Washington: a guide to geothermal energy development.** Bloomquist, R.G.; Basescu, N.; Higbee, C.; Justus, D.; Simpson, S. (Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Utilization Center). 1980. Contract AS06-77ET28476. 133p. NTIS, PC A07/MF A01.

A brief overview is given of the geological characteristics of each region of the state as they relate to potential geothermal development. Those exploration methods which can lead to the siting of a deep exploration well are described. Requirements and techniques needed for drilling deeper higher temperature exploration and production wells are presented. Electrical generation, direct utilization, and indirect utilization are reviewed. Economic factors of direct use projects are presented. A general guide to the regulatory framework affecting geothermal energy development is provided. The general steps necessary to gain access to explore, develop, distribute, and use geothermal resources are outlined. (MHR)

32070 (DOE/ET/28476—T6) **Geothermal resources in Oregon: site data base and development status.** Justus, D.L. (Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Utilization Center). Apr 1979. Contract AS06-77ET28476. 440p. NTIS, PC A19/MF A01.

Oregon's geothermal resources are inventoried and timeline scenarios are constructed which outline steps necessary for resource utilization. Potential for utilization and the legal and institutional environment in which development is likely to occur were also considered. Specific sites are presented within a regional framework. The planning regions covered are: basin and range, high lava plains, western Snake River plain, northeastern Oregon, and Cascade Mountains. (MHR)

32071 (DOE/ET/28476—T7) **Geothermal energy in Montana: site data base and development status.** Brown, K.E. (Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Utilization Center). Nov 1979. Contract AS06-77ET28476. 275p. NTIS, PC A12/MF A01.

A short description of the state's geothermal characteristics, economy, and climate is presented. A listing of the majority of the known hot springs is included. A discussion of present and projected demand is included. The results of the site specific studies are addressed within the state energy picture. Possible uses and process requirements of geothermal resources are discussed. The factors which influence geothermal development were researched and presented according to relative importance. (MHR)

32072 (DOE/ET/28476—T8) **Geothermal energy in Alaska: site data base and development status.** Markle, D. (Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Utilization Center). Apr 1979. Contract AS06-77ET28476. 573p. NTIS, PC A24/MF A01.

The following are presented: the history of geothermal energy in Alaska; a history of Alaska land ownership; legal and institutional barriers; and economics. Development, the socio-economic and physical data concerning geothermal energy are documented by regions. The six regions presented are those of the present Alaska State Planning Activities and those of the Federal Land Use Commission. Site data summaries of the one hundred and four separate geothermal spring locations are presented by these regions. (MHR)

32073 (DOE/RL/01049—T3) **Geothermal energy in Wyoming: site data base and development status.** James, R.W. (Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Utilization Center). Apr 1979. Contract AC06-77RL01049. 106p. NTIS, PC A02/MF A01.

An overview of geothermal energy and its current and potential uses in Wyoming is presented. Chapters on each region are concluded with a summary of thermal springs in the region. The uniqueness of Yellowstone is discussed from both an institutional point of view and a natural one. The institutional situation at the federal and state level is discussed as it applies to geothermal development in Wyoming. (MHR)

32074 (DOE/RL/01049—T4) **Geothermal resources in Oregon: site data base and development status.** Justus, D.L. (Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Utilization Center). Apr 1979. Contract AC06-77RL01049. 424p. NTIS, PC A18/MF A01.

An inventory of resources based on available information is presented. Potential for utilization and the legal and institutional environment in which development is likely to occur were also considered. Sites selected for this investigation include the 13 identified KGRA's, one PGRA which was chosen because of substantial local interest expressed in favor of development, and one major geologic fault zone which shows indications of high potential. Each chapter represents a planning region and is introduced by a regional overview of the physical setting followed by a narrative summary statement of the specific resource location and characteristics, existing utilization and potential end-uses for future development. Detailed site information in the form of data sheets follows each narrative. (MHR)

32075 (DOE/RL/01049—T6) **Geothermal energy in Montana: site data base and development status.** Brown, K.E. (Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Utilization Center). Nov 1979. Contract AC06-77RL01049. 276p. NTIS, PC A13/MF A01.

A short description of the state's geothermal characteristics, economy, and climate is presented. More specific information is included under the planning regions and site specific data summaries. A brief discussion of the geothermal characteristics and a listing of a majority of the known hot springs is included. The factors which influence geothermal development were researched and presented, including: economics, financing, state leasing, federal leasing, direct-use technology, water quality laws, water rights, and the Major Facility Siting Act. (MHR)

32076 (EPRI-AP—1457) **Geopressured energy availability. Final report.** (Southwest Research Inst., San Antonio, TX (USA)). Jul 1980. 136p. NTIS, PC A07/MF A01.

Near- and long-term prospects that geopressured/geothermal energy sources could become a viable alternative fuel for electric power generation were investigated. Technical questions of producibility and power generation were included, as well as economic and environmental considerations. The investigators relied heavily on the existing body of information, particularly in geotechnical areas. Statistical methods were used where possible to establish probable production values. Potentially productive geopressured sediments have been identified in twenty specific on-shore fairways in Louisiana and Texas. A total of 232 trillion cubic feet (TCF) of dissolved methane and 367 x 10^{15} Btu (367 quads) of thermal energy may be contained in the water within the sandstone in these formations. Reasonable predictions of the significant reservoir parameters indicate that a maximum of 7.6 TCF methane and 12.6 quads of thermal energy may be producible from these potential reservoirs.

32077 (HIG—79-4) **Potential geothermal resources in Hawaii: a preliminary regional survey. Phase I, final report.** Thomas, D.; Cox, M.; Erlandson, D.; Kajiwara, L. (Hawaii Univ., Honolulu (USA). Hawaii Inst. of Geophysics). Jun 1979. Contract AC03-76ET28302. 176p. NTIS, PC A09/MF A01.

A regional geothermal resource assessment has been conducted for the major islands in the Hawaiian chain. The assessment was made through the compilation and evaluation of the readily accessible geological, geochemical, and geophysical data for the Hawaiian Archipelago that have been acquired during the last two decades. The geologic criteria used in the identification of possible geothermal reservoirs were age and location of most recent volcanism on the island and the geologic structure of each island. The geochemical anomalies used as traces for geothermally altered groundwater were elevated silica concentrations and elevated chloride/magnesium ion ratios. Geophysical data used to identify subsurface structure with possible geothermal potential were aeromagnetic anomalies, gravity anomalies, and higher-than-normal well and basal spring discharge temperatures. Geophysical and geochemical anomalies that may be the result of subsurface thermal effects have been identified on the islands of Hawaii, Maui, Molokai, and Oahu.

NON-USA

32078 (SGP-TR—30, pp 228-233) **Bulalo geothermal reservoir Makiling-Banahao area, Philippines.** Messer, P.H.; de las Alas, V.F. (Philippine Geothermal, Inc., Metro Manila, Philippines). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

The Bulalo field, located within the Makiling-Banahao geothermal prospect, is being explored and developed. During the past four years, twenty-eight wells have been drilled and completed in the Bulalo heat anomaly. These wells have defined a large geothermal reservoir characterized by a high-temperature effluent which can be spontaneously produced to generate commercial power. An extensive flow testing program has resulted in the production of over thirteen billion pounds of reservoir effluent. After flashing the steam to atmospheric conditions, nearly seven billion pounds of produced reservoir fluid have been reinjected into the Bulalo reservoir. In spite of the large quantity of reservoir effluent that has been produced and reinjected, insufficient testing has been conducted to determine the total commercial power generating capacity of this large liquid-dominated reservoir. The preliminary estimate of generating capacity has led to the current installation of 220 MW. Field development for the installation of four 55 MW units is in progress. The initial 55 MW unit is scheduled for operation in July, 1979, with Unit 2 to operate in the fourth quarter of 1979.

GEOLOGY, HYDROLOGY, AND GEOTHERMAL SYSTEMS

32079 (LBL—9547) **Paleomagnetism of the Quaternary Cerro Prieto, Crater Elegante, and Salton Buttes volcanic domes in the northern part of the Gulf of California rhombochasm.** de Boer, J. (Wesleyan Univ., Middletown, CT (USA)). Feb 1980. Contract W-7405-ENG-48. 10p. (CONF-7910166—10). NTIS, PC A02/MF A01.

From 2. symposium on the Cerro Prieto Geothermal Field; Baja California, Mexico (17 Oct 1979).

Deviating thermomagnetic directions in volcanics representing the second and fifth or sixth pulse of volcanism suggest that the Cerro Prieto volcano originated about 110,000 years B.P. and continued to be active intermittently until about 10,000 years ago.

32080 (SGP-TR—30, pp 66-77) **Experimental study of the phase change by in-situ vaporization in porous medium.** Castanier, L.; Bories, S. 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

The experimental simulation of auto vaporization phenomena was made on a simple geometrical shape of the porous medium in which heat and mass transfers are mono-directional. The assumptions and local equations for a mathematical model are presented. (MHR)

32081 (SGP-TR—30, pp 78-82) **Pseudopressure of saturated steam.** Grant, M.A. (D.S.I.R., Wellington, New Zealand). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

The equations for definition and use of pseudopressure are written. Formulas are given for pseudopressure as a function of pressure and the equations are given in field units. (MHR)

32082 (SGP-TR—30, pp 234-238) **System approach to geothermal field development.** Hirakawa, S. (Univ. of Tokyo, Japan). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

The technology for geothermal resource development necessitates full application of every essential technique in order to cope with the various types of geothermal resources, and, since it has direct influence on the profitability of investment, it needs to be evaluated from an overall viewpoint. The evaluation, at the same time, must be carried out efficiently, invoking various effective methods. Simulation models were developed for optimizing the scheme from exploration to utilization and to compose simulation programs for a digital computer. (MHR)

32083 (SGP-TR—30, pp 264-269) **Stress and flow in fractured porous media.** Ayatollahi, M.S. (Lawrence Berkeley Lab., CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

A method was developed for simultaneous solution of stress and flow in a deformable fractured isotropic porous medium saturated with a single phase slightly compressible fluid. The system defined as such can be under the effect of body forces, boundary loads, initial stress, and influenced by some fluid pressure disturbance. The method involves application of the theory of elasticity for plane strain systems, Darcy's law for porous medium, and Biot's constitutive equations for the mixture of fluid and solid skeleton. The resulting initial boundary value problem is then numerically formulated into finite element equations using the calculus of variations. A computer program has been developed by modifying existing programs to consider interactions between fractures and porous medium when both flow and stress fields are coupled. The program is capable of handling problems in rock masses where fractures extend from one boundary to another, intersect each other, or are isolated in the porous medium. The fractures may have random orientations

and the rock matrix can be permeable or impermeable. The region under investigation may be two dimensional or axially symmetric. Solutions can be obtained for either a steady-state flow field under static equilibrium or a non-steady flow field in conjunction with quasi-static equilibrium conditions.

USA

REFER ALSO TO CITATION(S) 32077, 32096

32084 (SGP-TR—30, pp 133-138) **Locating the producing layers in HGP-A.** Kihara, D.; Chen, B.; Seki, A.; Yuen, P. (Univ. of Hawaii, Honolulu). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Two tests conducted in an attempt to locate multiple production zones in the Hawaii Geothermal project well are described briefly. Flow rates were measured at different depths under severely throttled conditions. The second series of tests consisted of cold water being pumped downhole at 115 gallons/minute while temperature and flow rate were monitored at selected depths. The temperature profiles obtained during these tests are plotted. (MHR)

32085 (SGP-TR—30, pp 286-293) **The Achilles' Heel of geothermal reservoir simulators.** Voss, C.I. (Royal Inst. of Tech., Stockholm, Sweden); Pinder, G.F. 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

The simulation of geothermal reservoirs involves the solution of the equations describing multiphase, non-isothermal flow in porous media. These equations are highly nonlinear, particularly as the solution encounters the boundary of the two-phase region. There are essentially as many ways of accommodating this nonlinearity as there are numerical models of geothermal reservoirs. However, there is no universally accepted method for establishing the relative accuracy of these techniques. Well-established methodologies such as Fourier analysis and comparison against analytical solutions are simply not applicable to nonlinear sytems. A necessary but not sufficient condition for convergence is the conservation of mass energy and momentum. This information is generally provided as an integral part of the numerical solution.

NON-USA

REFER ALSO TO CITATION(S) 32095

32086 (LBL—9546) **Intersecting faults and sandstone stratigraphy at the Cerro Prieto geothermal field.** Vonder Haar, S.; Howard, J.H. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Feb 1980. Contract W-7405-ENG-48. 15p. (CONF-7910166—11). NTIS, PC A02/MF A01.

From 2. symposium on the Cerro Prieto Geothermal Field; Baja California, Mexico (17 Oct 1979).

The northwest-southeast trending Cerro Prieto fault is part of a major regional lineament that extends into Sonaro and has characteristics of both a wrench fault and an oceanic transform fault. The distribution of lithologies and temperature within the field was studied by comparing data from well cuttings, cores, well logs, and geochemical analyses. Across the earliest developed portion of the field, in particular along a 1.25-km northeast-southwest section from well M-9 to M-10, interesting correlations emerge that indicate a relationship among lithology, microfracturing, and temperature distribution. In the upper portion of Reservoir A of this stratigraphic section, between 1200 and 1400 m, the percentage of sandstones ranges from 20 to 55. Temperatures are 225° to 275°C based on well logs, calcite isotope maxima, and Na-K-Ca indices. The study shows that an isothermal high in this vicinity corresponds to the lowest total percentage of sandstones. Scanning electron microphotographs of well cores and cuttings from sandstone and shale units reveal clogging, mineral dissolution, and mineral precipitation along microfractures. The working hypothesis is that these sandy shale and siltstone facies are most amenable to increased microfracturing and, in turn, such microfracturing allows for higher temperature fluid to rise to shallower depths in the reservoir.

32087 (LBL—9590) **Numerical modeling studies of the Cerro Prieto reservoir.** Lippmann, M.J.; Goyal, K.P. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Feb 1980. Contract W-7405-ENG-48. 13p. (CONF-7910166—13). NTIS, PC A02/MF A01.

From 2. symposium on the Cerro Prieto Geothermal Field; Baja California, Mexico (17 Oct 1979).

Based on existing data, different boundary conditions and material properties were simulated using a computer program to calculate heat and mass transport in liquid-saturated nonisothermal media. In these simulations, it was assumed that initially Cerro Prieto was essentially a one-phase (liquid-dominated) geothermal system. Steady-state temperatures were computed for various assumed preproduction recharge and discharge boundary conditions. The results are discussed and compared with published initial temperature distributions in the Cerro Prieto system.

32088 (SGP-TR—30, pp 36-41) **Geothermal reservoir engineering research in New Zealand.** Donaldson, I.G. (Physics and Engineering Lab., Lower Hutt, New Zealand). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

A variant of the drainage model is discussed here. In this the geothermal reservoir is pictured as a column of rock matrix saturated at depth with hot water but overlain in turn by columnar layers saturated with water and steam and with cold water. This reservoir is assumed to be surrounded by, and directly connected with, the cooler outside water. There are thus no structural boundaries as such although some permeability variation is anticipated. The shape of the actual column will be defined by the reservoir and it may vary significantly from level to level. For the majority of the exercise only the integrated flows up the column are of interest, but horizontal flows and the pattern of vertical flow across the reservoir have been taken into account. With its application to other geothermal reservoirs several variants on this basic model have evolved but for Wairakei the cooler upper layer has been added to permit the accounting for the quenching recently of the shallow well WK 107. It is hoped that it may also assist in explaining, quantitatively, the slow reduction in temperature of the main water zone of the reservoir. This is dropping in temperature by 1-2°C per year. (MHR)

32089 (SGP-TR—30, pp 332-342) **Simulation of the Broadlands geothermal field, New Zealand.** Zyvoloski, G.A.; O'Sullivan, M.J. (Univ. of Auckland, New Zealand). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

The governing equations for a two phase geothermal reservoir are presented for the case when a substantial amount of carbon dioxide is present. Sample results for a model reservoir based on the Broadlands geothermal field are given.

GEOTHERMAL EXPLORATION AND EXPLORATION TECHNOLOGY

REFER ALSO TO CITATION(S) 32066, 32068, 32069, 32072, 32077

32090 (HIG—79-8) **Investigation of geothermal potential in the Waianae Caldera Area, Western Oahu, Hawaii. Assessment of Geothermal Resources in Hawaii: Number 2.** Cox, M.E.; Sinton, J.M.; Thomas, D.M.; Mattice, M.D.; Kauahikaua, J.P.; Helstern, D.M.; Fan, P. (Hawaii Univ., Honolulu (USA). Hawaii Inst. of Geophysics). Sep 1979. Contract AC03-76ET28302. 82p. NTIS, PC A05/MF A01.

Studies of Lualualei Valley, Oahu have been conducted to determine whether a thermal anomaly exists in the area and, if so, to identify sites at which subsurface techniques should be utilized to characterize the resource. Geologic mapping identifies several caldera and rift zone structures in the Valley and provides a tentative outline of their boundaries. Clay mineralogy studies indicate that minor geothermal alteration of near-surface rocks has occurred at some period in the history of the area. Schlumberger resistivity soundings indicate the presence of a low resistivity layer beneath the valley floor, which has been tentatively attributed to warm water-saturated basalt. Soil and groundwater chemistry studies outline several geochemical anomalies around the perimeter and within the inferred caldera boundaries. The observed anomalies strongly suggest a subsurface heat source. Recommendations for further exploratory work to confirm the presence of a geothermal reservoir include more intensive surveys in a few selected areas of the valley as well as the drilling of at least three shallow (1000-m) holes for subsurface geochemical, geological and geophysical studies.

GEOPHYSICAL TECHNIQUES AND SURVEYS

32091 (DOE/ER/10401—T1) **Application of natural electromagnetic field methods (magnetotellurics/geomagnetic variations) to exploring for energy resources: development of a broad-band data acquisition/processing facility. Topical report, May 1, 1979-April 30, 1980.** Hermance, J.F. (Brown Univ., Providence, RI (USA). Dept. of Geological Sciences). 1980. Contract AS02-79ER10401. 5p. NTIS, PC A02/MF A01.

Progress is summarized in the following fields: a review of the present state of knowledge of the deep thermal regimes associated with major rift systems of the world, field studies of several major tectonomagmatic systems, and design and testing of new magnetotelluric/geomagnetic variation field system for studying thermal regimes in the continental crust. (MHR)

32092 (HIG—79-7) **Temperature profiles in wells on the island of Hawaii.** Epp, D.; Halunen, A.J. Jr. (Hawaii Univ., Honolulu (USA).

Hawaii Inst. of Geophysics). Aug 1979. 33p. Hawaii Inst. of Geophysics, Honolulu.

Temperature versus depth is reported for 21 wells on the island of Hawaii. The highest temperatures were measured in wells on Kilauea's east rift zone in the Puna area. Temperatures decrease rapidly north and south of the rift zone. Above-average temperatures were observed in two wells in the south Kohala area.

32093 (LA-UR—80-1486) **Magnetotelluric/audiomagnetotelluric study of the Zuni Hot Dry Rock Geothermal Prospect, New Mexico.** Ander, M.E.; Goss, R.; Strangway, D.; Hillebrand, C.; Laughlin, A.W.; Hudson, C. (Los Alamos Scientific Lab., NM (USA); Woodward-Clyde Consultants, San Francisco, CA (USA); Toronto Univ., Ontario (Canada). Dept. of Physics). 1980. Contract W-7405-ENG-36. 5p. (CONF-800920—1). NTIS, PC A02/MF A01.

From Geothermal Resource Council annual meeting; Salt Lake City, UT, USA (9 Sep 1980).

The Los Alamos Scientific Laboratory has been investigating a large area in New Mexico for Hot Dry Rock geothermal potential. The area includes parts of the Jemez volcanic lineament and the central Rio Grande rift. LASL has completed a detailed magnetotelluric/audiomagnetotelluric survey covering 161 square km over an area of high heat flow, south of Zuni, NM. The data collection was collected and preliminary analysis phases of a regional MT survey which suggest the Jemez lineament is associated with a crustal structure of anomalously high electrical conductivity. The detailed MT shows an average tipper strike of N60°E above 100 sec period, representing the structural trend within Precambrian basement. The Jemez lineament strikes approximately N55°E; this suggests a relationship between the Precambrian structure beneath the Zuni area and the Jemez lineament.

32094 (LBL—9544) **Geological interpretation of self-potential data from the Cerro Prieto geothermal field.** Corwin, R.F.; Fitterman, D.V. (California Univ., Berkeley (USA); Geological Survey, Denver, CO (USA)). Feb 1980. Contract W-7405-ENG-48. 5p. (CONF-7910166—12). NTIS, PC A02/MF A01.

From 2. symposium on the Cerro Prieto Geothermal Field; Baja California, Mexico (17 Oct 1979).

A source mechanism based on concepts of irreversible thermodynamics and consisting of heat or fluid flow along a north-south trending zone of faulting is proposed for the self-potential anomaly measured over the Cerro Prieto geothermal reservoir. The source region is represented by a vertical plane of that separates regions of differing streaming potential or thermoelectric coupling coefficients. The coupling coefficient contrast could be caused by vertical offset of rock units along faults. The depth to the top of the source plane is about 1.3 km, its vertical extent is about 11 km, and its length along strike is about 10 km. Geological, geophysical, and mineralogical evidence supports the existence of an important north-south geological trend roughly corresponding in location to the proposed self-potential source plane.

32095 (SGP-TR—30, pp 217) **Wairakei geothermal field reservoir engineering data.** Pritchett, J.W.; Rice, L.F.; Garg, S.K. (Systems, Science, and Software, La Jolla, CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

32096 (USGS-OFR—80-826) **Analysis of thermal data from drill holes UE25a-3 and UE25a-1, Calico Hills and Yucca Mountain, Nevada Test Site.** Sass, J.H.; Lachenbruch, A.H.; Mase, C.W. (Geological Survey, Menlo Park, CA (USA)). 1980. 25p. Geological Survey, Menlo Park, CA.

Thermal data from two sites about 20 km apart in the Nevada Test Site indicate that heat flow both within and below the upper 800 meters is affected significantly by hydrothermal convection. For hole UE25a-1, Yucca Mountain, the apparent heat flow above the water table (~ 470 m) is 54 mWm^{-2} (~ 1.3 HFU). Below the water table, the temperature profile indicates both upward and downward water movement within the hole and possibly within the formation. Hole UE25a-3, Calico Mountain, is characterized by conductive heat flux averaging 135 mWm^{-2} (~ 3.2 HFU) to a depth of about 700 meters below which water appears to be moving downward at the rate of nearly 1 ft y^{-1} (255 mm y^{-1}). Between 735 and 750 meters, the hole intersected a nearly vertical fault along which water seems to be moving vertically downward. The nearly threefold variation in conductive heat flow over a lateral distance of only 20 km suggests the presence of a more deeply seated hydrothremal convective system with a net upward flow beneath Calico Hills and a net downward flow beneath Yucca Mountain.

GEOCHEMICAL TECHNIQUES AND SURVEYS

REFER ALSO TO CITATION(S) 32143

32097 (SGP-TR—30, pp 96-105) **Downhole measurements and fluid chemistry of a castle rock steam well, The Geysers, Lake County, California.** Truesdell, A.H. (U.S. Geological Survey, Menlo Park, CA); Frye, G.A.; Nathenson, M. 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Certain wells within The Geysers steam field have standing water columns either when first drilled or when produced at low flow rates. These water columns have been attributed to accumulation of water condensing in the well bore. Alternative explanations are that perched water bodies exist within the reservoir or that a deep water body underlying the steam reservoir has been tapped. A well in the Castle Rock field of The Geysers drilled by Signal Oil and Gas Company (now Aminoil, U.S.A.) with such a water column was sampled in 1976 for water, gas, and isotope chemistry in hopes of distinguishing between these possible origins; the results along with the well history and downhole pressure and temperature measurements are reported here.

32098 (SGP-TR—30, pp 201-206) **Recent radon transient experiments.** Kruger, P.; Semprini, L.; Cederberg, G.; Macias, L. (Stanford Univ., CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Radon transient analysis is being developed as a method complementary to pressure transient analysis for evaluation of geothermal reservoirs. The method is based on the observations of Stoker and Kruger (1975) that radon concentration in produced geothermal fluids is related to geothermal reservoir type, production flow rates, and time. Stoker and Kruger showed that radon concentrations were markedly different in vapor-dominated and liquid-dominated systems, and varied not only among wells of different flow rate in an individual reservoir, but also varied timewise in individual wells. Three radon transient tests have been carried out, each in a different type of geothermal resource. The first test was in a petrothermal resource, the reservoir created by hydraulic fracturing by LASL in the hot, dry rock experiment in New Mexico. The second test was a second transient test at the HGP-A well in the liquid-dominated reservoir at Pohoiki, Hawaii, and the third test was a second transient test at the Grottitana well in the Serrazzano field at Larderello, Italy. The general observations of these tests are listed. A summary of each of these three tests is presented. (MHR)

EXPLORATORY DRILLING AND WELL LOGGING

32099 (LA-UR—80-1903) **Calibration models for fractured igneous rock environments.** Mathews, M. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 5p. (CONF-800920—24). NTIS, PC A02/MF A01.

From Geothermal Resource Council annual meeting; Salt Lake City, UT, USA (9 Sep 1980).

At the present time, geophysical well logs are not calibrated for igneous and metamorphic lithologies or for fracture porosity. These geologic conditions are routinely encountered in geothermal reservoirs and geothermal fields. Three large calibration models or test pits are presently being fabricated. Each calibration model will be constructed of large stone blocks which have a cored-borehole and wire-sawn simulated fractures. Details of the test pit size, simulated fracture locations, rock type of each test pit, and location and access of these pits are discussed.

32100 (SAND—80-0078) **275°C thick-film hybrid microcircuitry fabrication technology.** Bonn, P.A.; Palmer, D.W. (Sandia National Labs., Albuquerque, NM (USA)). Jul 1980. Contract AC04-76DP00789. 43p. NTIS, PC A03/MF A01.

High-temperature electronics is needed for geothermal well-logging tools, jet engine monitors, nuclear reactor instruments, and fossil fuel exploration and production systems. The step-by-step fabrication technology of thick-film hybrids useful for at least 1000 hours at 275°C is described. Hybrid technology, qualified to standard military specifications, was modified both in materials and fabrication processes to achieve this high-temperature operation. In addition to documenting this Sandia-developed technology, various alternate approaches are described to increase the versatility and applicability of these methods.

32101 (SGP-TR—30, pp 213-216) **Evaluation of a geothermal well logging, DST and pit test.** Tansev, E.O. (Chevron Resources Co., San Francisco, CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Logging and testing operations and related physical aspects in geothermal well evaluations are discussed briefly. (MHR)

LEGAL AND INSTITUTIONAL ASPECTS

REFER ALSO TO CITATION(S) 32065, 32066, 32068, 32069, 32072, 32417

32102 (DOE/ID/12018—3) **Colorado geothermal institutional handbook: a user's guide of agencies regulations, permits, and aids for geothermal development.** Coe, B.A.; Forman, N.A. (Colorado Geological Survey, Denver (USA)). May 1980. Contract FC07-79ID12018. 44p. NTIS, PC A03/MF A01.

The following are included: principal state agencies, applicable state legislation, applicable state regulations, local agencies and regulations, federal agencies and regulations, information sources, and agencies and individuals. (MHR)

ECONOMIC AND FINANCIAL ASPECTS

REFER ALSO TO CITATION(S) 32064

32103 (DOE/RA/50075—T1) **Mid-term report for the State of Nevada. Geothermal Commercialization Planning Project.** (Nevada Dept. of Energy, Carson City (USA)). 1980. Contract FC03-80RA50075. 10p. NTIS, PC A02/MF A01.

The project purposes, objectives, technical approach, benefits to the state and DOE, summary of state project tasks, and specific task descriptions are listed. (MHR)

32104 **Percentage depletion for geothermal energy: an alternative method for calculation of gross income.** Packer, M.B. (Massachusetts Inst. of Tech., Cambridge). *Land Water Law Rev.;* **15**: No. 2, 429-443(1980).

As the search for alternative energy sources intensifies in the United States, more attention is being focused upon geothermal energy. The issue of how to tax this natural resource has been an active, if not satisfactorily resolved one. The Energy Tax Act of 1978 explicitly authorizes percentage depletion allowances for geothermal deposits, but in a manner not well suited to developing geothermal technology. The problems which have arisen under the current Treasury regulations on the subject suggest more-appropriate method of calculation based on a return-on-investment model, and offering some relief for the taxpayer. 29 references.

ENVIRONMENTAL ASPECTS AND WASTE DISPOSAL

REFER ALSO TO CITATION(S) 32109, 32131, 32820

32105 (LBL—10839) **Case study data base companion report 3 to simulation of geothermal subsidence (LBL-10571).** Miller, I.; Dershowitz, W.; Jones, K.; Myer, L.; Roman, K.; Schauer, M. (Golder Associates, Inc., Kirkland, WA (USA)). Mar 1980. Contract W-7405-ENG-48. 76p. (GSRMP—9). NTIS, PC A05/MF A01.

The data base developed for selection and evaluation of geothermal subsidence case studies is presented. Data from this data base were used in case studies of Wairakei, The Geysers, and Austin Bayou Prospect (Report LBL 10571).

32106 (P—300-80-004) **Assessment of H_2S control technologies for geothermal power plants.** (Acurex Corp., Mountain View, CA (USA)). Feb 1980. 121p. California Energy Commission, Sacramento, CA.

Techniques for controlling hydrogen sulfide (H_2S) from geothermal development are analyzed. Several technologies for controlling H_2S emissions from power plants are examined. The Hydrogen Peroxide Combination System, Stretford System and possibly EIC or Coury upstream controls appear capable of compliance with the emission limitations of 100 grams per hour per gross megawatt in 1980 (and 50 q/hr/(g) MW in 1985 or 1990) at the Geysers Dry stream field in Northern California. Unresolved problems still plague all these options. Well field operations result in H_2S releases from well drilling, well venting and steam stacking. Hydrogen peroxide reduces H_2S emissions during drilling and venting can be controlled with vent gathering (condensation/reinjection) systems. Steam stacking during power plant outages emit more H_2S over shorter periods than other field operations. Potential controls for stacking are: (1) upstream abatement, (2) automated well operation, (3) computerized wellfield operation (as of PG and E's Geysers Unit No. 15), and (4) further steamfield interconnection (cross-overs).

32107 (SGP-TR—30, pp 280-285) **Preliminary reservoir and subsidence simulations for the Austin Bayou geopressured geothermal prospect.** Garg, S.K.; Riney, T.D.; Brownell, D.H. Jr. (Systems, Science, and Software, La Jolla, CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Pending the availability of actual well test data, estimated reservoir properties have been employed in numerical simulations to study the effects of variations in reservoir properties on the projected long-term behavior of the Austin Bayou Prospect. The simulations assess the sesitivity of the reservoir behavior to variations in estimated sandstone/shale distribution, shale compressibility, and vertical shale permeablity. Further, hypothetical properties for the stress-deformation behavior of the rock formations were employed in a very preliminary study of the potential ground surface displacements that might accompany fluid production. (MHR)

BY-PRODUCTS

REFER ALSO TO CITATION(S) 31597

GEOTHERMAL POWER PLANTS

REFER ALSO TO CITATION(S) 32106, 32148

32108 (EGG—2034) **Semiannual progress report for the Idaho Geothermal Program, October 1, 1979-March 31, 1980.** Ihrig, R.R. (ed.). (Idaho National Engineering Lab., Idaho Falls (USA)). Jul 1980. Contract AC07-76ID01570. 35p. NTIS, PC A03/MF A01.

Progress is reported for the Idaho Geothermal program between October 1, 1979 and March 31, 1980. Progress on the 5-MW Pilot Power Plant at the Raft River Geothermal Test Site is summarized including construction, steady-state and transient analyses by computer modeling, the geothermal water treatment program, and additional experimental and theoretical work on direct contact heat exchangers. Asbestos-cement pipe failures in the geothermal fluid supply and injection system are also summarized. The successful automatic control-mode testing of the Prototype Power Plant is reported. A continuing direct applications experiment in aquaculture is outlined, and a proposal to study various ramifications of irrigating agricultural and range lands with spent geothermal fluid is described briefly. Also outlined is the second experimental hydraulic fracture treatment of a geothermal well at Raft River as part of the National Well Stimulation Program. The improvements to the Raft River site facilities are described, and progress in providing technical information and assistance in the Outreach, or User Assistance program presented. Also presented is a new DOE program, the User Coupled Confirmation Drilling Program, which is intended to reduce the financial risk of hydrothermal reservoir exploration by the private sector. Progress reports are also included on DOE's Program Opportunity Notice (PON) Program demonstration projects and Program Research and Development Announcement (PRDA) Program study projects.

32109 **Tapping the main stream of geothermal energy.** Whitaker, R.; Roberts, V.; Hughes, E. *EPRI J.;* **5**: No. 4, 6-15(May 1980).

Electric power generation success using geothermal energy at The Geysers has motivated nationwide identification and assessment of hydrothermal resources, as well as research and pilot projects for energy conversion. US geothermal projects are underway to take advantage of both high and moderate water temperature and pressure. About half of the electricity-grade hydrothermal energy in the United States is in the high-temperature range and can be converted using direct-flash steam cycle technology. The other half is in the moderate-temperature range, for which the binary cycle is used. The binary cycle involves a second fluid that vaporizes at a much lower temperature than water. The Heber Project in California will be the first direct-flash commercial generation plant. Some of the technical and environmental problems of the direct-flash cycle are being studied by the Electric Power Research Institute. The binary cycle is still in the pilot-to-demonstration stage. As the authors point out, the bottom line is still a combination of reliability and busbar electricity cost. The cost must meet the competitive market set by other fuels and technologies. Along these lines, the future of geothermal energy looks promising. (SAC)

DESIGN AND OPERATION

32110 (CONF-800681—1) **5MW Raft River facility experience.** Whitbeck, J.F. (EG and G Idaho, Inc., Idaho Falls (USA)). 1980. Contract AC07-76ID01570. 5p. NTIS, PC A02/MF A01.

From EPRI geothermal workshop; Monterey, CA, USA (23 Jun 1980).

The Raft River geothermal plant is a small binary cycle conversion system which uses isobutane as the working fluid. This plant uses a staged boiler concept to achieve better performance than could be obtained by a single boiler. The plant was designed to operate with a geothermal water inlet temperature of 143°C (290°F) and produce a nominal generator output of 5MW. The plant is supported by a supply and injection system consisting of three supply wells (about 1524m or 5000 ft deep) and two injection wells (about 1158m or 3800 ft deep). Experience in several important areas: environmental, supply and injection system, and power plant, are discussed. (MHR)

32111 (CONF-800920—8) **Raft River 5-MW(e) geothermal pilot plant project.** Rasmussen, T.L.; Whitbeck, J.F. (EG and G Idaho, Inc., Idaho Falls (USA)). 1980. Contract AC07-76ID01570. 3p. NTIS, PC A02/MF A01.

From Geothermal Resource Council annual meeting; Salt Lake City, UT, USA (9 Sep 1980).

The Raft River 5-MW(e) Pilot Plant Project was started in 1976. Construction is scheduled for completion in July 1980, with three years of engineering and operational testing to follow. The plant utilized a 280°F geothermal fluid energy source and a dual boiling isobutane cycle. Developmental efforts are in progress in the areas of down hole pumps and chemical treatment of geothermal fluid for cooling tower makeup.

32112 (CONF-800920—9) **Operational upset transients in a dual boiling binary cycle geothermal power plant.** Wiggins, D.J.; Bliem, C.J. (EG and G Idaho, Inc., Idaho Falls (USA)). 1980. Contract AC07-76ID01570. 5p. NTIS, PC A02/MF A01.

From Geothermal Resource Council annual meeting; Salt Lake City, UT, USA (9 Sep 1980).

The effects of operational upsets (such as a valve or pump failure) on a dual boiling binary power plant with isobutane as the working fluid are discussed. These results are based on a mathematical simulation using vendor specifications of the existing components and materials in the 5MW(e) Raft River Pilot Plant. The major problems which can result are excessive heat-up or cool-down rates in the heat exchangers and reverse flow into lower pressure areas. Effects of upsets on plant operation are discussed and appropriate counteractive operator action is recommended.

32113 (LBL—9808) **500 kW direct contact pilot plant for East Mesa.** Nichols, K.E. (Barber-Nichols Engineering Co., Arvada, CO (USA)). Sep 1979. Contract W-7405-ENG-48. 26p. (CONF-790906—33). NTIS, PC A03/MF A01.

From Geothermal Resources Council annual meeting; Reno, NV, USA (24 Sep 1979).

A 500 kW powerplant utilizing a direct contact heat exchanger (DCHX) between the geothermal brine and the isobutane working fluid is nearing completion at the East Mesa Component Test Facility. The primary purpose of the plant is to evaluate the performance potential of the direct contact system in a size much larger than the small exploratory units that have been tested to date. Thermodynamic performance of DCHX binary power systems has been demonstrated in small 10 kW research test rigs (Refs. 1, 2, and 3), however, characteristics that affect the economics and practicality of long term operation need to be evaluated. Three factors influencing plant performance and cost are: (1) the control of noncondensables that contaminate the power cycle condenser, (2) the equipment required to limit working fluid losses, and (3) the control of scaling or performance robbing deposits in critical components. These factors are not unrelated and control of one often impacts control of the other two. Operating data and research with the 500 kW pilot plant should demonstrate a solution to all three of these factors and provide design guidelines for larger plants.

32114 (LBL—10974) **Importance of the specific heat anomaly in the design of binary Rankine cycle power plants.** Pope, W.L.; Doyle, P.A.; Fulton, R.L.; Silvester, L.F. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). May 1980. Contract W-7405-ENG-48. 5p. (CONF-800920—25). NTIS, PC A02/MF A01.

From Geothermal Resource Council annual meeting; Salt Lake City, UT, USA (9 Sep 1980).

The transposed critical temperature (TPCT) is shown to be an extremely important thermodynamic property in the selection of working fluids and turbine states for geothermal power plants operating on a closed organic (binary) Rankine cycle. When the optimum working fluid composition and process states are determined for specified source and sink conditions, turbine inlet states consistently lie adjacent to the working fluids' TPCT line for all resource temperatures, constraints, and cost and efficiency factors investigated.

POWER PLANT SYSTEMS AND COMPONENTS

32115 (CONF-800806—36) **Condenser designs for binary power cycles.** Michel, J.W.; Murphy, R.W. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 14p. NTIS, PC A02/MF A01.

From 15. intersociety energy conversion engineering conference; Seattle, WA, USA (18 Aug 1980).

For the past four years, work has been in progress at ORNL to develop improved condensers for geothermal binary power cycles. The work has centered on optimizing the design variables associated with fluted surfaces on vertical tubes and comparing the tube performance with available enhanced tubes either for vertical or horizontal operation. Data with seven fluids including a hydrocarbon, fluorocarbons, and ammonia condensing on up to 30 different tubes have been obtained. Data for tubes of different effective lengths (0.15 to 1.20 m) and inclination have also been obtained. The primary conclusion from this work is that fluted tubes can provide an enhancement in condensation coefficient of a factor of 6 over smooth vertical tubes and a factor of 2 over enhanced commercial tubes either operating vertically or horizontally. These data, together with field test data, have formed the basis for designing two prototype condensers, one for the 60 kWe Raft River, Idaho, pilot plant and one for the 500 kWe East Mesa, California, direct-contact demonstration plant.

32116 (LBL—10312) **Transposed critical temperature Rankine thermodynamic cycle.** Pope, W.L.; Doyle, P.A. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Apr 1980. Contract W-7405-ENG-48. 68p. NTIS, PC A04/MF A01.

The transposed critical temperature (TPCT) is shown to be an extremely important thermodynamic property in the selection of the working fluid and turbine states for optimized geothermal power plants operating on a closed organic (binary) Rankine cycle. When the optimum working fluid composition and process states are determined for given source and sink conditions (7 parameter optimization), turbine inlet states are found to be consistently adjacent to the low pressure side of the working fluids' TPCT line on pressure-enthalpy coordinates. Although the TPCT concepts herein may find numerous future applications in high temperature, advanced cycles for fossil or nuclear fired steam power plants and in supercritical organic Rankine heat recovery bottoming cycles for Diesel engines, this discussion is limited to moderate temperature (150 to 250°C) closed simple organic Rankine cycle geothermal power plants. Conceptual design calculations pertinent to the first geothermal binary cycle Demonstration Plant are included.

32117 (LBL—11025) **Condensation film coefficients for mixtures of isobutane and isopentane.** Tleimat, B.W.; Rie, H.; Laird, A.D.K.; Zhao, S. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.; California Univ., Richmond (USA). Sea Water Conversion Lab.). May 1980. Contract W-7405-ENG-48. 6p. (CONF-800806—34). NTIS, PC A02/MF A01.

From 15. intersociety energy conversion engineering conference; Seattle, WA, USA (18 Aug 1980).

Research designed to obtain baseline data on heat transfer for working fluids in geothermal binary cycle systems is described. The working fluid loop in the experimental apparatus simulates the binary cycle with steam as the heating fluid and a throttling valve instead of the turbine. Data on film coefficient for the condensation of 90/10 and 80/20 mixtures of isobutane-isopentane on a horizontal tube at various temperatures and condensation rates are presented. Data indicate that mixtures of isobutane-isopentane have lower condensation film coefficients than that of the pure isobutane under equivalent conditions of temperatures and condensation rates. Depending on the mass condensation rate, the film coefficient for the 80/20 mixture can be as low as 30 percent of the film coefficient for pure isobutane at the same mass condensation rate.

32118 (ORNL/TM—7400) **Composition of gases vented from a condenser.** Lyon, R.N. (Oak Ridge National Lab., TN (USA)). Aug 1980. Contract W-7405-ENG-26. 13p. NTIS, PC A02/MF A01.

Designers of systems that involve condensers often need to predict the amount of process vapor that accompanies the noncondensable gases that are vented from the condensers. An approximation is given that appears to provide, in many cases, reasonably accurate values for the mole ratio of process vapor to noncondensable gases in the vented mixture. The approximation is particularly applicable to flash and direct-contact power systems for geothermal brines and ocean thermal energy conversion (OTEC). More regorous relationships are available for exceptional cases.

GEOTHERMAL ENGINEERING

DRILLING TECHNOLOGY AND WELL HARDWARE

REFER ALSO TO CITATION(S) 32128, 32157

32119 (LA-UR—80-2086) **Directional drilling equipment and techniques for deep hot granite wells.** Brittenham, T.L.; Sursen, G.; Neudecker, J.W.; Rowley, J.C.; Williams, R.E. (Grace, Sursen, Moore and Associates, Amarillo, TX (USA); Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 10p. (CONF-800931—3). NTIS, PC A02/MF A01.

From 55. Society of Petroleum Engineers of AIME annual technical conference and exhibition; Dallas, TX, USA (21 Sep 1980).

Conventional directional drilling technology has been extended and modified to drill the first well of a subsurface geothermal energy extraction system at the Fenton Hill, New Mexico, Hot dry Rock (HDR) experimental site. Completing the first of a two-wellbore HDR system has resulted in the definition of operational limitations of many conventional directional drilling tools, instrumentation and techniques. The successful completion of the first wellbore, Energy Extraction Well No. 2 (EE-2), to a measured

depth of 15,300 ft (4.7 km) in granite reservoir rock with a bottom-hole temperature of 530°F (275°C) required the development of a new high temperature downhole motor and modification of existing wireline-conveyed steering tool systems. Conventional rotary-driven directional assemblies were successfully modified to accommodate the very hard and abrasive rock encountered while drilling nearly 8500 ft (2.6 km) of directional hole to a final inclination of 35° from the vertical at a controlled azimuthal orientation.

32120 (SAND—80-1234) **Geothermal drilling and completion technology development program. Quarterly progress report, April-June 1980.** Varnado, S.G. (ed.). (Sandia National Labs., Albuquerque, NM (USA)). Jul 1980. Contract AC04-76DP00789. 275p. NTIS, PC A12/MF A01.

The progress, status, and results of ongoing Research and Development (R & D) within the Geothermal Drilling and Completion Technology Development Program are described. The program emphasizes the development of geothermal drilling hardware, drilling fluids, completion technology, and lost circulation control methods. Advanced drilling systems are also under development. The goals of the program are to develop the technology required to reduce well costs by 25% by 1983 and by 50% by 1987.

32121 (SAND—80-1351C) **Laboratory testing of percussion drills for geothermal applications.** Finger, J.T. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 4p. (CONF-800920—12). NTIS, PC A02/MF A01.

From Geothermal Resource Council annual meeting; Salt Lake City, UT, USA (9 Sep 1980).

Laboratory tests of percussion drilling tools which were done at Drilling Research Lab, Salt Lake City, during February 1980, are described. The purpose of the tests was threefold: (a) to compare the parenetration rates of different hammers with each other and with conventional rotary drilling; (b) to measure and compare the hammer pulses at normal and high temperatures; and (c) to establish hammer life and failure modes at high temperature. Two roller bit hammers and three solid bit hammers were tested. All exhibited much higher rates of penetration in granite than were obtained with conventional rotary techniques. Tests at high temperature revealed several failure modes for the air driven hammers. Minor modifications should allow operation of these hammers at high temperature.

32122 (SGP-TR—30, pp 5-14) **Recent activities at the Cerro Prieto field.** Alonso, E.H. (Comision Federal de Electricidad, Baja California, Mexico); Dominguez, A.B.; Lippmann, M.J.; Manon, M.A.; Schroeder, R.C.; Witherspoon, P.A. 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Some of the latest activities of interest to reservoir engineers at the Cerro Prieto geothermal field are described. Special emphasis is given to the wells drilled in 1978 for exploration purposes and to provide steam to the existing and future power plants. The present power output is 75 MW. Two additional 37.5 MW units are scheduled to go on line in March and May 1979, while the total generating capacity at Cerro Prieto will reach about 400 MW in 1985.

CORROSION, SCALING, AND MATERIALS DEVELOPMENT

32123 (BM-RI—8415) **Laboratory corrosion studies in low- and high-salinity geobrines of the Imperial Valley, California.** Cramer, S.D.; Carter, J.P. (Bureau of Mines, Avondale, MD (USA). Avondale Research Center). 1980. 35p. Bureau of Mines, Washington, DC.

Corrosion research is being conducted by the Federal Bureau of Mines to determine suitable construction materials for geothermal resource recovery plants. As part of this research, the corrosion resistance of 31 iron-, nickel-, aluminum-, copper-, titanium-, and molybdenum-base alloys was characterized and evaluated in laboratory corrosion studies in low- and high-salinity geobrines representative of those found in the Imperial Valley, California. General, crevice, pitting, weld, and stress corrosion were measured at 105° and 232°C in deaerated brines and brines containing dissolved O_2, CO_2, and CH_4.

32124 (LBL—7033) **Kinetics of silica polymerization.** Weres, O.; Yee, A.; Tsao, L. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). May 1980. Contract W-7405-ENG-48. 265p. NTIS, PC A12/MF A01.

The polymerization of silicic acid in geothermal brine-like aqueous solutions to produce amorphous silica in colloidal form has been studied experimentally and theoretically. A large amount of high quality experimental data has been generated over the temperature rang 23 to 100°C. Wide ranges of dissolved silica concentration, pH, and sodium chloride concentration were covered. The catalytic effects of fluoride and the reaction inhibiting effects of aluminum and boron were studied also. Two basic processes have been separately studied: the formation of new colloidal particles by the homogeneous nucleation process and the deposition of dissolved silica on pre-existing colloidal particles. A rigorous theory of the formation of colloidal particles of amorphous silica by homogeneous nucleation was developed. This theory employs the Lothe-Pound formalism, and is embodied in the computer code SILNUC which quantitatively models the homogeneous nucleation and growth of colloidal silica particles in more than enough detail for practical application. The theory and code were extensively used in planning the experimental work and analyzing the data produced. The code is now complete and running in its final form. It is capable of reproducing most of the experimental results to within experimental error. It is also capable of extrapolation to experimentally inaccessible conditions, i.e., high temperatures, rapidly varying temperature and pH, etc.

32125 (SGP-TR—30, pp 42-49) **Replacement of geothermal reservoir brine as a means of reducing solids precipitation and scale formation.** Martin, J.C. (Chevron Oil Field Research Co., La Habra, CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Results of an investigation of the possibility of injecting a different water in a geothermal reservoir as a means of reducing problems caused by solids precipitation and scale formation are presented. Corrosion problems may also be reduced depending upon the water-rock-metal behavior. The results are confined chiefly to reservoir mechanics, a logical first step in evaluating the process for a given reservoir. In general the composition of water injected into geothermal reservoirs does not remain the same. In addition to mixing with the original water the injected water tends to equilibrate with the reservoir rock. If fresh water is injected it may pick up such minerals as silica, carbonate, iron, sulphur, etc. These minerals may precipitate and cause problems in producing the reservoir. Nevertheless, under suitable conditions, a change in the reservoir water may be an attractive alternative to cycling the original reservoir brine.

32126 (SGP-TR—30, pp 294-299) **Predicting the precipitation of amorphous silica from geothermal brines.** Weres, O.; Yee, A.; Tsao, L. (Lawrence Berkeley Lab., CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

A large quantity of nucleation data was generated from room temperature to 100°C and a computer program was written which can numerically (and rigorously) model the homogeneous nucleation process. After the necessary parameters were fitted using experimental data, it was possible to quantitatively model and predict the process, even under the experimentally inaccessible conditions characteristic of field practice. This program was documented and made available to interested outside users. The molecular deposition process was studied by adding known amounts of colloidal silica of known specific surface area to the solutions. Deposition rates at pH 7, $[Na^+] = 0.069$ and various temperatures and dissolved silica concentrations were calculated (and extrapolated) from experimental data and are presented. It has long been believed that the rate of amorphous silica deposition is proportional to the surface density of ionized silanol groups on the silica surface. Experiments on the pH dependence of the rate proved this hypothesis conclusively. It was found that the rate as a function of pH calculated from the data matched surface charge vs. pH data in the literature to within experimental error. It was found that the reaction rate ceases to increase in proportion to surface change at about pH 8. This is due to the offsetting effect of the increase of silica solubility with increasing pH. The data suggest that a constant pH correction factor of about 2.7 is adequate between about pH 8 and 9. (MHR)

GEOTHERMAL RESERVOIR AND WELL PERFORMANCE

REFER ALSO TO CITATION(S) 32076, 32078, 32084, 32098

32127 (DOE/ET/27225—T3) **Models for geothermal wells.** Michaelides, E.E. (Brown Univ., Providence, RI (USA)). Jun 1980. Contract AC02-79ET27225. 148p. NTIS, PC A07/MF A01.

Thesis.

The problem of two-phase flow pressure loss is examined in order to give an answer to the problem of determination of the wellhead conditions. For this purpose two models have been developed, the first based on the pattern structure of the flow and the second on the mixing length theory. The void fraction correlations and the transition conditions are presented in the first model as a means of estimating the pressure loss. Heat losses, and the effect of impurities are examined in detail. An expression for the critical flow conditions is also derived. The model is used to predict the available power at the wellhead under various conditions and an answer to the problem of well pumping is given. For the second model an outline of the mixing length theory and the boundary layer coordinates is given; a density distribution in the geothermal well is assumed and the equations for the pressure loss are derived by means of the entropy production function. Finally a comparison of the two models is made and their predictive power is tested against known well data. A brief comparison with the Denver Research Institute is also made.

32128 (DOE/ET/28460—3(Vol.1)) **Investigation and evaluation of geopressured-geothermal wells. Final report: Beulah Simon No. 2 Well, Vermilion Parish, Louisiana. Volume I. Completion and testing.** Dobson, R.J.; Hartsock, J.H.; McCoy, R.L.; Rodgers, J.A. (Gruy Federal, Inc., Houston, TX (USA)). Jul 1980. Contract AC08-77ET28460. 110p. NTIS, PC A06/MF A01.

Geopressured-geothermal (Geo^3) test operations were conducted at the Beulah Simon No. 2 well site during the period from September through December 1979. The well provided the second geopressured-geothermal test to be completed under the DOE-Gruy Well of Opportunity program. The completion in a geopressured aquifer of Oligocene age at approximately 14,700 feet and the testing of hot salt water from this zone were accomplished without significant difficulty. Some problems were encountered with the wireline and wireline high-pressure lubricator associated with the running of bottomhole instruments. The objectives of the project were all accomplished, and good test data were obtained on the flow rates of gas and water. The gas content was 24 standard cubic feet per stock tank barrel of water. The disposal well accepted the full wellhead stream at temperatures as high as 255°F (124°C). Over the 10-day flow period the hot brine did not appear to adversely affect the clay minerals in the disposal aquifer. A conclusion from this operation is that presently available wirelines and pressure lubricators are not adaptable for use with uninhibited well fluids under flowing conditions. In addition, this test demonstrated that injection of scale inhibitor down the annulus eliminated scale buildup within the flow string and surface facilities. (MHR)

32129 (DOE/ET/28460—3(Vol.2)) **Investigation and evaluation of geopressured-geothermal wells. Final report: Beulah Simon No. 2 Well, Vermilion Parish, Louisiana. Volume II. Analytical data.** Dobson, R.J.; Hartsock, J.H.; McCoy, R.L.; Rodgers, J.A. (Gruy Federal, Inc., Houston, TX (USA)). Jul 1980. Contract AC08-77ET28460. 167p. NTIS, PC A08/MF A01.

A compilation of the test data and computer printouts of the various reservoir calculations for the reentry of the Beulah Simon No. 2 well are presented. The data include: bottomhole and surface pressure data, geothermal field test data, pressure buildup model analysis, recombination of produced brine, chemical analyses of brine and gas, and chemical analyses performed by Champion Chemicals, Inc. (MHR)

32130 (SGP-TR—30) **Proceedings fourth workshop geothermal reservoir engineering.** Kruger, P.; Ramey, H.J. Jr. (eds.). (Stanford Univ., CA (USA). Stanford Geothermal Program). 1978. Contract AT03-76ET28364. 336p. (CONF-781222—). NTIS, PC A15/MF A01.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Forty-three papers are included. Five papers were abstracted previously. Separate abstracts were prepared for thirty-eight. (MHR)

32131 (SGP-TR—30, pp 15-35) **Progress report on the DOE/DGE/LBL reservoir engineering and subsidence programs.** Howard, J.H.; Noble, J.E.; Schwarz, W.J.; Graf, A.N. (Lawrence Berkeley Lab., CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Administrative highlights of the FY 1978 reservoir engineering program are listed. Technical and scientific progress accomplished during the year and the contracts for these work areas are tabulated. Brief sketches of these contracts and their achievements are presented. The organization and accomplishments of the ground subsidence program are discussed. (MHR)

32132 (SGP-TR—30, pp 106-111) **Formation plugging while testing a steam well at The Geysers.** Strobel, C.J. (Union Oil Co. of California, Santa Rosa). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

During testing of a steam well at The Geysers steam field in Sonoma County, California, rate suddenly dropped by 17,500 lb/hr and wellhead pressure simultaneously increased by 30 psi. There was no evidence of plugging in any of the surface facilities down stream of the wellhead. Pressure buildup tests before and after the incident show that there was a 15% reduction in permeability-thickness. Analysis of pressure losses in the wellbore due to friction showed that all of the rise in wellhead pressure could be explained by the reduction in mass flow that occurred as a result of the 15% reduction in kh. The change in wellhead enthalpy from 1200 Btu/lb and 4°-5°F superheat prior to the incident to 1197 Btu/lb and 0-1.4°F superheat after the incident indicates the well became slightly wet. One possible explanation for this reduction in kh is that movement of free water caused a plugging action or a reduction of mobility to steam in one or more steam entries.

32133 (SGP-TR—30, pp 112-117) **Effect of thermal conduction upon pressure drawdown and buildup in fissured, vapor-dominated geothermal reservoirs.** Moench, A.F. (Geological Survey, Menlo Park, CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

A finite-difference model is modified to incorporate heat transfer from blocks of impermeable rock to thin, highly-permeable, porous fissures. The purpose of this study is to demonstrate the added effect of heat transfer of this type upon the transient pressure response of a vapor-dominated geothermal reservoir.

32134 (SGP-TR—30, pp 139-145) **Results of well-testing in the Broadlands geothermal field, New Zealand.** Horne, R.N.; Grant, M.A.; Gale, R.O. 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Although not the first hot-water geothermal field under development, the Broadlands geothermal field has shown itself to be quite different in behaviour to other hot-water fields. The field was discharged some five years between 1966 and 1971, and has provided a large source of data in its as yet undeveloped state. Some of the results inferred from well-testing are presented and (1) the complexity of the system, (2) the importance of wellbore storage effects and (3) the effects of reinjection are highlighted.

32135 (SGP-TR—30, pp 146-152) **Mechanism of reservoir testing.** Bodvarsson, G. (Oregon State Univ., Corvallis). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Some fundamentals of the theory of reservoir testing are discussed where the fluid conductivity field is the primary target. The emphasis is on local and global aspects of the forward approach to the case of liquid saturated (dominated) Darcy type formations. Both controlled and natural driving pressure or strain fields are considered and particular emphasis is placed on the situation resulting from the effects of a free liquid surface at the top of the reservoir. (MHR)

32136 (SGP-TR—30, pp 153-159) **Field example of free surface testing.** Bodvarsson, G. (Oregon State Univ., Corvallis); Zais, E. 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Theoretical results on free liquid surface dynamics provide the basis for a technique of reservoir probing and testing which can yield results that are supplementary to conventional well testing data. The Laugarnes geothermal area in Iceland which is one of the sources of the Reykjavik District Heating System is a case where both methods are applicable and appear to yield different results. A brief account of the free surface results is presented. (MHR)

32137 (SGP-TR—30, pp 160-164) **Geothermal reservoir testing based on signals of tidal origin.** Bodvarsson, G. (Oregon State Univ., Corvallis); Hanson, J. 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

In the simplest setting involving a single open well connected by a small spherical cavity to a large homogeneous and isotropic reservoir, the mechanism of the tidal well test is shown on the basis of the model illustrated here. Concentrating first on cases where boundary effects can be ignored, it is assumed that the skin depth of the reservoir material at tidal frequencies is smaller than the extent of the reservoir including the depth of the well. Interpretation of well data and deviations from the basic model are discussed. (MHR)

32138 (SGP-TR—30, pp 165-175) **Pressure drawdown analysis for the Travale 22 well.** Barelli, A.; Brigham, W.E.; Cinco, H.; Economides, M.; Miller, F.G.; Ramey, H.J. Jr.; Schultz, A. (Stanford Univ., CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Preliminary results are presented on the analysis of drawdown data for Travale 22. Both wellhead pressure and flow rate data were recorded in this well for over a period of almost two years. The possible presence of a vertical fracture intersecting the Travale 22 well oriented along the N73° direction is indicated. The pressure seems to stabilize at 400 days, indicating a possible constant pressure boundary. (MHR)

32139 (SGP-TR—30, pp 176-187) **Injection testing in geothermal wells.** Saltuklaroglu, M. (Elc-Electroconsult, Milano, Italy); Rodriguez, J.R. 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Transient pressure analysis methods were applied to analyze the results of injection tests carried out in a recently completed geothermal well in Los Azufres Geothermal field in Mexico. Potential use of those methods (employing injection, two rate injection and fall off tests) is illustrated in obtaining important well and reservoir parameters at the well completion stage and in predicting

future well performance. Also, based on the experience obtained with this well and other similar wells, suggestions are made on the type of analysis which is most applicable.

32140 (SGP-TR—30, pp 188-200) **Recent developments in well test analysis in the Stanford geothermal program.** Ehlig-Economides, C. (Stanford Univ., CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

A number of studies pertaining to geothermal well test analysis were conducted. A brief overview of progress on the following six subjects is presented: (1) earth tide effects on a closed reservoir, (2) transient pressure analysis of multilayered heterogeneous reservoirs, (3) interference testing with wellbore storage and skin at the producing well, (4) steam/water relative permeabilities, (5) transient rate and pressure buildup resulting from constant pressure production, and (6) transient pressure analysis of a parallelepiped reservoir.

32141 (SGP-TR—30, pp 207-212) **Evaluation of James' empirical formulae for the determination of two-phase flow characteristics in geothermal wells.** Cheng, P.; Karmarkar, M. (Univ. of Hawaii, Honolulu). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

The wellbore discharge characteristics obtained from James' empirical formulas are compared to those predicted by Fauske's two-phase critical flow theory. Fauske suggested that in two-phase flow the maximum discharge rate may not necessarily be accomplished by a shock front. He proposed that at the critical flow condition the absolute value of the pressure gradient at a given location is maximum but finite for a given flow rate or quality.

32142 (SGP-TR—30, pp 218-227) **Recent reservoir engineering developments at Brady Hot Springs, Nevada.** Rudisill, J.M. (Thermal Power Co., San Francisco, CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Brady's Hot Springs is a hydrothermal area located approximately 28Km northeast of Fernley, Nevada. Surface manifestations of geothermal activity occur along a north-northeast trend fault zone (herein referred to as the Brady Thermal Fault) at the eastern margin of Hot Springs Flat, a small basin. Since September, 1959, numerous wells have been drilled in the area. In 1977 Magma's 160 acre lease in Section 12 was assigned to Geothermal Food Processors (GFP) for the purpose of providing heat from the wells on this acreage for the dehydration of food. GFP made application to the Geothermal Loan Guarantee Program (GLGP) for assistance in financing the effort, and consequently the GLGP office turned to the USGS for a resource evaluation. The USGS in turn recommended that a pumped flow test was necessary to truly determine the ability of the acreage's wells to provide the requisite water flow rate, temperature, and composition for the plant's operating lifetime of at least 15 years. Consequently, Thermal Power Company was contacted and procured to design, arrange, conduct, and evaluate a pumped flow program to satisfy these questions.

32143 (SGP-TR—30, pp 239-263) **Use of fluid geochemistry to indicate reservoir processes at Cerro Prieto, Mexico.** Truesdell, A.H. (Geological Survey, Menlo Park, CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Regular chemical sampling and analysis of fluids produced from the hot-water geothermal system of Cerro Prieto, Mexico has provided early warning of reservoir processes. The changes in chloride concentration, sodium to potassium ratio and measured fluid enthalpy are shown for wells M-5, M-26, M-21A, and M-11 of the Cerro Prieto field. The concentration of chloride, a conservative constituent, is characteristic of different water masses and is affected by a change of water source, by mixing of waters and by boiling and steam loss but not by reaction with rock minerals. The ratio of sodium to potassium is a temperature-sensitive geothermal index resulting from rock-water reaction and is not affected by boiling and steam loss or by mixing of water masses provided these processes occur at constant temperature. The enthalpy is related to the fluid temperature and to boiling in the aquifer with excess steam entering the well. These indices provide a reasonably complete picture of major reservoir processes occurring in hot water systems. Silica analyses have not been reliable from Cerro Prieto but should be used in addition to Na/K as a temperature indicator. Analysis of fluids from a producing geothermal field must of course include other constituents for study of environmental effects, scaling, corrosion, etc.

32144 (SGP-TR—30, pp 272-274) **Annotated research bibliography for geothermal reservoir engineering.** Randall, G.S.; Harrison, R.F. (Terra Tek, Salt Lake City, UT). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

An annotated bibliography has been prepared to assist in avoiding duplication of reservoir engineering research and serve as a definitive record of the progress and current status of the subject. The bibliography included English, Italian, Russian and Japanese language publications. Individual documents have been grouped under the following major subject categories: formation evaluation, reservoir modeling, exploitation strategies, and evaluation of production trends. (MHR)

32145 (UCRL—84461) **Reservoir response to tidal and barometric effects.** Hanson, J.M. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 29 May 1980. Contract W-7405-ENG-48. 5p. (CONF-800920—13). NTIS, PC A02/MF A01.

From Geothermal Resource Council annual meeting; Salt Lake City, UT, USA (9 Sep 1980).

Solid earth tidal strain and surface loading due to fluctuations in barometric pressure have the effect, although extremely minute, of dilating or contracting the effective pore volume in a porous reservoir. If a well intersects the formation, the change in pore pressure can be measured with sensitive quartz pressure gauges. Mathematical models of the relevant fluid dynamics of the well-reservoir system have been generated and tested against conventional well pumping results or core data at the Salton Sea Geothermal Field (SSGF), California and at the Raft River, Geothermal Field (RRGF), Idaho. Porosity-total compressibility product evaluation based on tidal strain response compares favorably with results based on conventional pumping techniques. Analysis of reservoir response to barometric loading using Auto Regressive Integrated Moving Average (ARIMA) stochastic modeling appears also to have potential use for the evaluation of reservoir parameters.

RESERVOIR STIMULATION AND EXTRACTION TECHNOLOGY

32146 (LA-UR—80-2103) **Location of hydraulic fractures using microseismic techniques.** Albright, J.A.; Pearson, C.F. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 19p. (CONF-800931—2). NTIS, PC A02/MF A01.

From 55. Society of Petroleum Engineers of AIME annual technical conference and exhibition; Dallas, TX, USA (21 Sep 1980).

Microearthquakes with magnitudes ranging between -6 and -2 have been observed in three successive massive injections of water at the Hot Dry Rock Geothermal Energy demonstration site at Fenton Hill, New Mexico. The injection was part of a program to increase the heat transfer area of hydraulic fractures and to decrease the flow-through impedance between wells. The microearthquakes were used in mapping the location of the extended hydraulic fractures. A downhole triaxial system positioned approximately 200 m vertically above the injection point in a shut-in production well was used for detection. The microearthquakes occurred in a north-northwest striking zone 400 m in length passing through the injection point. During a third substantially larger injection, microearthquakes occurred in a dispersed volume at distances as great as 800 m from the zone active in the first two injections.

32147 (SGP-TR—30, pp 270-271) **Spacing and width of cooling cracks in rock.** Bazant, Z.P. (Northwestern Univ., Evanston, IL). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

DIRECT ENERGY UTILIZATION

REFER ALSO TO CITATION(S) 32108, 32142

32148 (AD-A—076341) **Economic feasibility study of the geothermal project for the Naval Station, Adak, Alaska. Technical memo.** Bruce, J.L. (Naval Weapons Center, China Lake, CA (USA)). Jan 1979. 46p. NTIS, PC A03/MF A01.

The Adak Geothermal Project is concerned with the use of geothermal energy as a possible alternative to the present fossil fuel energy system on Adak. Three different types of geothermal energy systems, each based on an assumed different reservoir temperature range, are considered. These systems, which could supply the facilities on Adak with energy for space heating or complete electrical power including electrical heating, are: (1) space heating using either above-ground insulated fiberglass pipelines or in-ground insulated steel pipelines, (2) direct electrical power generation using geothermal fluids either at a central power plant or via individual wellhead generating units, either system producing 25 MWe gross output, or (3) a binary geothermal electrical power generation facility where the geothermal fluids would heat a secondary (binary) fluid which would operate the electrical generating equipment, producing a 25 MWe gross output. The cost of each system was analyzed, and cost-effectiveness was determined by comparing the investment cost with projected fuel savings. An investment return (payback period) for

each system was determined using an 8% annual fuel escalation factor. A comparison was made between the Navy price for JP-5 aviation fuel (main fuel on Adak) and the apparent real cost of this type fuel to other remote regions in Alaska. This gave comparative payback costs of this type of energy system if developed by private industry.

32149 (DOE/CS/31072—T1) **Study of aluminum corrosion in aluminum solar heat collectors using aqueous glycol solution for heat transfer. Semiannual technical progress report, July 30, 1979-January 31, 1980.** Wong, D.; Cocks, F.H.; Giner, J. (Giner, Inc., Waltham, MA (USA)). Feb 1980. Contract AC04-79CS31072. 24p. NTIS, PC A02/MF A01.

The present work is addressed primarily to the study of the effects of glycol aging at elevated temperatures (above 100°C). Glycols are known to be susceptible to thermal decomposition producing new product species which may be aggressive to aluminum. In addition, the possible breakdown of corrosion inhibitors due to long term exposure to high temperature are also investigated. Both uninhibited and inhibited ethylene (as well as propylene) glycols have been aged at temperatures up to 190°C for over 2000 h continuously to date. Aliquot samples of each glycol solution tested in this program were taken at 1000 and 2000 h of exposure for chemical analysis and pH measurement. Based on the data obtained so far, solution pH was found to decrease steadily with exposure time. The critical pitting potential of 1100 series aluminum in a 50 vol % aqueous ethylene glycol solution is reported as functions of both temperature and chloride ion concentration. This information is essential in the cathodic protection of pitting corrosion of aluminum.

32150 (DOE/ET/27232—T4) **Utilization of geothermal energy in the mining and processing of tungsten ore. 2nd quarterly report.** Erickson, M.V.; Willens, C.A.; Walter, K.M.; Carrico, R.L.; Lowe, G.D.; Lacy, S.B. (WESTEC Services, Inc., San Diego, CA (USA)). Jun 1980. Contract AC03-79ET27232. 174p. NTIS, PC A08/MF A01.

The completed geochemical analysis of groundwater in the Pine Creek area for evaluation of the geothermal potential of this location is presented. Also included is an environmental constraints analysis of Pine Creek noting any potential environmental problems if a geothermal system was developed onsite. Design of a geothermal system is discussed for site-specific applications and is discussed in detail with equipment recommendations and material specifications. A preliminary financial, economic, and institutional assessment of geothermal system located totally on Union Carbide property at Pine Creek is included. (MHR)

32151 (JHU/APL-QM—80-101) **Geothermal energy development in the Eastern United States. Technical assistance report No. 4. Geothermal space heating: Pittsville Middle/Elementary School, Pittsville, Maryland.** Briesen, R.V.; Yu, K. (Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.). Jun 1980. Contract AI01-76RA50090. 33p. NTIS, PC A03/MF A01.

A technical evaluation was made to determine whether geothermal energy obtained from a well could be used to space heat the new school building being constructed as well as the existing elementary wing of the Pittsville School. The first part deals with space heating the new school building only; the second part pertains to space heating the new school building together with the new existing wing. An addendum was added for new well and production pump costs. (MHR)

32152 (P—500-80-009) **Geothermal heating demonstration project at Mammoth Lakes Village. Final report.** Sims, A.V.; Campbell, R.G. (Holt (Ben) Co., Pasadena, CA (USA)). Mar 1980. 81p. California Energy Commission, Sacramento, CA.

A pilot project is described which demonstrated the feasibility of using geothermal energy for space heating and snow-melting at the Casa Diablo geothermal reservoir near Mammoth Lakes Village, California. The geothermal heating system employed was modeled after the geothermal district heating system used extensively in Iceland. The geothermal heating system incorporated a closed secondary heating loop (Iceland's system uses the geothermal fluids directly) to provide heat to a lumber store, warehouse and display area, and to melt snow on a connecting walkway between the buildings. The secondary loop, containing a mixture of fresh water and ethylene glycol, was heated by geothermal fluids produced from a nearby well. After passing through a heat exchanger, the cooled geothermal fluids were reinjected down another well. The heating system operated for three different periods, and the project concluded after a successful, long-term demonstration of well pump and heating system operation. Pump problems encountered early in the project were solved, and information gained in the final operation period indicated that reliable, extended periods of well pump operation can be achieved. The hydronic heaters effectively heated buildings, and the snow-melting walkway performed very well during winter operation.

GEOTHERMAL DATA AND THEORY

REFER ALSO TO CITATION(S) 32081

PROPERTIES OF MINERALS AND ROCKS

32153 (SGP-TR—30, pp 50-53) **Changes in permeability during flow of water through granite subjected to a temperature gradient.** Lockner, D.; Bartz, D.; Byerlee, J. (U.S. Geological Survey, Menlo Park, CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Experiments were designed to study permeability changes in rock due to fluid flow along a temperature gradient to further understanding of how heat production in geothermal reservoirs may depend on these effects. Cylindrical samples of Westerly Granite, 8.9 cm long, 7.6 cm in diameter, and containing a 0.66 diameter borehole, were used. A resistance heater was placed in the borehole as a heat source, giving a radially symmetric temperature gradient. Confining pressure and pore pressure were applied to the sample; a pore pressure gradient was applied to induce radial flow either toward or away from the borehole. An apparent permeability, averaged over the whole sample, was calculated from Darcy's Law by measuring the pore fluid flow rate. (MHR)

32154 (SGP-TR—30, pp 54-59) **Laboratory investigations of steam pressure-transient behavior in porous materials.** Herkelrath, W.N.; Moench, A.F. (U.S. Geological Survey, Menlo Park, CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

In order to test the applicability of the gas-flow theory to steam flow, a laboratory system was developed to investigate the transient flow of steam through unconsolidated porous materials. Pressure-transient experiments were carried out by imposing a step change in gas pressure at one end of a cylinder of porous material, and measuring the pressure as a function of time at the other end.

32155 (SGP-TR—30, pp 60-65) **Bench-scale experiments in the Stanford geothermal project.** Counsil, J.R.; Hsieh, C.H.; Ehlig-Economides, C.; Danesh, A.; Ramey, H.J. Jr. (Stanford Univ., CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

The Stanford Geothermal Project bench-scale experiments are designed to improve the understanding of geothermal reservoir physics. Three sets of experiments are discussed: (1) vapor pressure lowering in porous media due to capillarity and adsorption, (2) the effect of temperature on absolute permeability, and (3) the determination of steam-water relative permeability for drainage processes.

32156 (SGP-TR—30, pp 84-95) **Compressional and shear wave velocities in water filled rocks during water-steam transition.** Ito, H.; DeVilbiss, J.; Nur, A. (Stanford Univ., CA). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

Both compressional and shear wave velocities were measured in water-filled Berea sandstone as a function of pore pressure under a constant confining pressure of 200 bar. At 145.5°C, compressional velocity increased from steam-saturated (low pore pressure) to water-saturated (high pore pressure) rock, whereas shear wave velocity decreased. Furthermore, a velocity minimum, attenuation and dispersions occur at water-steam transition for compressional wave. Results at 198°C show that both compressional and shear velocities decrease from steam-saturated to water-saturated rock, and a small velocity minimum is observed for compressional waves, but no attenuation nor dispersion occur. At both temperatures, the V/sub p/V/sub s/ ratio and Poisson's ratio increased from steam-saturated to water-saturated rock. The results are reasonably compatible with the mechanical effects of mixing steam and water in the pore space near the phase transition, and may be applicable to in situ geothermal field evaluation.

ROCK-WATER-GAS INTERACTIONS

32157 (DOE/TIC—11227) **Gas evolution from geopressured brines.** Matthews, C.S. (Department of Energy, Washington, DC (USA)). Jun 1980. 156p. NTIS, PC A08/MF A01.

The process of gas evolution from geopressured brine is examined using as a basis the many past studies of gas evolution from liquids in porous media. A discussion of a number of speculations that have been made concerning gas evolution from geopressured brines is provided. According to one, rapid pressure reduction will cause methane gas to evolve as when one opens a champagne bottle. It has been further speculated that evolved methane gas would migrate up to form an easily producible cap. As a result of detailed analyses, it can be concluded that methane gas evolution from geopressured brines is far too small to ever form a connected gas saturation except very near to the producing well. Thus, no signifi-

cant gas cap could ever form. Because of the very low solubility of methaned in brine, the process of methane gas evolution is not at all analogous to evolution of carbon dioxide from champagne. A number of other speculations and questions on gas evolution are analyzed, and procedures for completing wells and testing geopressured brine reservoirs are discussed, with the conclusion that presently used procedures will provide adequate data to enable a good evaluation of this resource.

32158 (SGP-TR—30, pp 275-279) **Simulation of geothermal reservoirs including changes in porosity and permeability due to silica-water reactions.** Li, T.M.C.; Mercer, J.W.; Faust, C.R.; Greenfield, R.J. (Geological Survey, Reston, VI). 1978.

From 4. workshop on geothermal reservoir engineering; Stanford, CA, USA (13 Dec 1978).

A mathematical model was developed which can simulate the changes in porosity and permeability resulting from water-rock reactions in a geothermal reservoir. The model being developed describes the flow of hot water in an axially symmetric porous medium. The model is a vertical cross-section in r-z coordinates. For simplicity, only a single dissolved chemical species is modeled. The fluid is single-phase water and only dissolution and precipitation of quartz are considered. (MHR)

TIDAL POWER

WAVE ENERGY CONVERTERS

32159 (AD-A—076133) **Coast guard evaluation of a wave activated turbine generator buoy. Final report Jan 73—Sep 77.** Hilliker, D.J.; Colburn, W.E.; Cutler, J.W. Jr. (Coast Guard Research and Development Center, Groton, CT (USA)). Sep 1977. 77p. NTIS, PC A05/MF A01.

Wave activated turbine generator buoys were tested at Chesapeake Light (14 miles off Cape Henry, Virginia) and in Boston Harbor. The buoys were instrumented to record cumulative power generated and later modified to record sea state as well as other variables pertinent to turbine operation. Results are presented as long-term power generation, power generation as a function of wave height and period, and transfer functions from spectral analysis of data.

32160 Method for collecting energy from swell and plant for carrying out said method. Lorphelin, M. US Patent 4,177,643. 11 Dec 1979. Priority date 2 Nov 1976, France, 8p.

A method is described for collecting energy from a swell in a fluid medium using a mobile float which is displaceable in response to movements of the swell. The float is submergible in the fluid medium at a predetermined depth selected such that, in the absence of movement of the fluid medium, the upwardly and downwardly directed forces acting on the float counterbalance each other so that the float is in equilibrium at such predetermined depth. The buoyancy of the float is adjusted to maintain it in equilibrium.

32161 Simulation studies of the basic non-linear effects of wave-energy conversion by an overtopping water-column. Knott, G.F.; Flower, J.O. (Univ of Sussex, Falmer, Brighton, Engl). *Energy Convers.;* **19**: No. 1, 59-69(1979).

Several forms of wave-energy devices are currently being developed which incorporate oscillating ducted-flows. A method of extracting energy from such flows has been suggested whereby fluid is allowed to spill over from the top end of the duct during some portion of the oscillatory cycle into an elevated reservoir from whence it is directed through a low-head turbine. A mathematical model of this energy conversion system has been derived for simulation on a digital computer; and the results of the analysis are presented here in terms of the efficiency of operation relative to the optimum linear case. The simulation is repeated for a wide range of input conditions and operating parameters. The conclusions drawn from this work may be seen to have a wider application in the field of non-linear energy exchange in resonant mechanical systems. 4 refs.

WIND ENERGY

REFER ALSO TO CITATION(S) 31772

32162 (CONF-791097—, pp 339-342) **Overview of the federal dispersed wind system program.** Tennyson, G. (Dept. of Energy, Albuquerque, NM). Jun 1980.

From 4. biennial conference and workshop on wind energy conversion systems; Washington, DC, USA (28 Oct 1979).

Program objectives and administrative controls are reviewed for the US DOE Small Systems and Analyses Program.

32163 (CONF-791097—, pp 343-348) **Government commercialization plans for wind energy.** Ankrum, G.T. (Dept. of Energy, Washington, DC). Jun 1980.

From 4. biennial conference and workshop on wind energy conversion systems; Washington, DC, USA (28 Oct 1979).

The feasibility of the commercialization of wind turbines in the US is discussed. The commercial aspects of the US DOE large wind turbine program are reviewed.

32164 (DOE/CS/20097—01) **Wind energy systems: program summary.** (Raytheon Service Co., Arlington, VA (USA)). May 1980. Contract AC01-78ET20097. 237p. NTIS, PC A11/MF A01.

The Federal Wind Energy Program (FWEP) was initiated to provide focus, direction and funds for the development of wind power. Each year a summary is prepared to provide the American public with an overview of government sponsored activities in the FWEP. This program summary describes each of the Department of Energy's (DOE) current wind energy projects initiated or renewed during FY 1979 (October 1, 1978 through September 30, 1979) and reflects their status as of April 30, 1980. The summary highlights ongoing research, development and demonstration efforts and serves as a record of progress towards the program objectives. It also provides: the program's general management structure; review of last year's achievements; forecast of expected future trends; documentation of the projects conducted during FY 1979; and list of key wind energy publications.

AVAILABILITY (CLIMATOLOGY)

REFER ALSO TO CITATION(S) 31843

32165 (CONF-791097—, pp 245-248) **Key issues associated with wind characteristics and wind energy siting.** Wendell, L.L. (Pacific Northwest Lab., Richland, WA). Jun 1980.

From 4. biennial conference and workshop on wind energy conversion systems; Washington, DC, USA (28 Oct 1979).

Information is presented concerning resource assessment; siting methodologies; design and performance evaluation; and wind characteristics for operations.

32166 (P—500-80-024) **Wind resource assessment in California.** Berry, E.X. (Atmospheric Research and Technology, Inc., Sacramento, CA (USA)). May 1980. 74p. California Energy Commission, Sacramento.

This report was prepared in response to the need to develop a wind prospecting methodology unique to California. The major contribution of this work is the development of a new mathematical-physics formulation which is an improvement of wind-energy resource assessment methodology. The report provides a strategy for wind-energy prospecting, a design for a wind prospecting instrument, and a method of analysis of wind-energy data. The formulation also produces an improved basis for the calculation of wind-machine performance using only a few wind parameter measurements. Recommendations are made to increase concentration on land use and environmental issues, to develop more scientific methodologies for wind prospecting, and to require that in all state-sponsored wind projects both a standardized set of wind information and computerized data records be provided.

32167 (PNL—3195-WERA-1) **Wind energy resources atlas. Volume 1. Northwest region.** Elliott, D.L.; Barchet, W.R. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Apr 1980. Contract AC06-76RL01830. 192p. NTIS, PC A09/MF A01.

Information is presented concering regional wind energy resource assessment; regional features; and state features for Idaho, Montana, Oregon, Washington, and Wyoming.

32168 Wind resource and siting requirements. Knox, J.B. (Lawrence Livermore Lab., CA). pp 617-664 of Solar energy technology handbook. Part A. Engineering fundamentals. Dickinson, W.C.; Cheremisinoff, P.N. (eds.). New York, NY; Marcel Dekker, Inc. (1980).

Information is presented concerning wind energy resource; the U.S. wind energy conversion program; siting requirements; methodologies for site requirements; and future research directions.

ECONOMICS

REFER ALSO TO CITATION(S) 32177, 32183

32169 (DOE/ET/20063—T1(Exect.Summ.)) **Wind energy systems. Application to regional utilities.** . (JBF Scientific Corp., Wilmington, MA (USA)). Jun 1979. Contract AC01-76ET20063. 40p. NTIS, PC A03/MF A01.

This study developed a generic planning process that utilities can use to determine the feasibility of utilizing WECS (Wind Energy Conversion Systems) as part of their future mix of equipment. While this is primarily an economic process, other questions dealing with WECS availability, capacity credit, operating reserve, performance of WECS arrays, etc., had to be addressed. The approach was to establish the worth, or breakeven value, of WECS to the utility and to determine the impact that WECS additions would have on the utilities mix of conventional source.

32170 (DOE/ET/20063—T1(Vol.2)) **Wind energy systems application to regional utilities.** (JBF Scientific Corp., Wilmington, MA (USA)). Sep 1979. Contract AC01-76ET20063. 339p. NTIS, PC A15/MF A01.

A methodology for analyzing the economic impact of WECS on a utility is described in Volume I of this report. The methodology requires extrapolating both historical utility load data and historical wind power into a year of analysis; calculating the total amount of funds made available in that year, as a result of the inclusion of wind power in the utility mix; and then estimating the present value of the total funds made available to the utility over the life of the WECS. To apply the methodology to a specific case, it was necessary to develop various computer programs. The following sections in this report list the programs developed for this study, briefly summarize their contents, and explain how they are used. Wherever possible, a typical input/output file is shown.

WIND ENERGY ENGINEERING

REFER ALSO TO CITATION(S) 31864

32171 (AD-A—076315) **Fluid dynamic aspects of wind energy conversion.** Vries, O.D. (Advisory Group for Aerospace Research and Development, 92 - Neuilly-sur-Seine (France)). Jul 1979. 150p. NTIS, PC A07/MF A01.

A review is made of the fluid dynamic aspects of wind energy conversion. A short survey of the total framework of wind energy conversion is given to bring the fluid dynamics aspect in its proper dimensions. Next, the several wind concentrator concepts are discussed, while the main body of the report is formed by a discussion of the theory of wind-driven turbines, including both the horizontal-axis and the vertical-axis turbines. The report concludes with a survey of inhomogeneous flow and turbulence effects, turbine control and wake interference effects.

APPLICATIONS

32172 (CONF-791097—, pp 59-74) **Key issues associated with the commercialization of small wind energy conversion systems.** Trenka, A. (Rockwell International, Golden, CO). Jun 1980.

From 4. biennial conference and workshop on wind energy conversion systems; Washington, DC, USA (28 Oct 1979).

Three major topic areas were considered during the Small Wind Turbine Systems 1979 Workshop in Boulder: (1) research and development requirements; (2) utility interface issues; and (3) institutional issues. The key issues discussed in this paper were those raised in the various presentations at the workshop and discussed during audience participation sessions and panel discussions. Several issues are also discussed concerning SWECS commercialization.

32173 (CONF-791097—, pp 137-149) **Key issues associated with large scale systems.** Thomas, R.L. (Lewis Research Center, Cleveland, OH). Jun 1980.

From 4. biennial conference and workshop on wind energy conversion systems; Washington, DC, USA (28 Oct 1979).

The key issues associated with large wind turbines are discussed. Information is presented concerning technology readiness, potential for significant impact, acceptability of these machines, what does it take for the creation of a competitive wind turbine industry, and public acceptance.

32174 (CONF-791097—, pp 197-201) **Bureau of reclamation's wind/hydroelectric energy project.** Barrett, C. (Bureau of Reclamation, Washington, DC). Jun 1980.

From 4. biennial conference and workshop on wind energy conversion systems; Washington, DC, USA (28 Oct 1979).

Reclamation's activities in wind energy development at Medicine Bow, Wyoming are discussed. The study, which covers a 600 square mile area, has as its principal objective the evaluation of integrating a wind energy farm having about 100 megawatt capacity with storage and electric generating capabilities of the Colorado River Storage Project. The Bureau's basic approach to wind energy has been to integrate wind energy on a large scale basis with our very large network of reservoirs and hydroelectric generation stations.

TURBINE DESIGN AND OPERATION

32175 (CONF-791097—) **Proceedings of the fourth biennial conference and workshop on wind energy conversion systems.** Kottler, R.J. Jr. (ed.). (JBF Scientific Corp., Arlington, VA (USA)). Jun 1980. Contract AC01-79ET20365. 639p. NTIS, PC A99/MF A01.

From 4. biennial conference and workshop on wind energy conversion systems; Washington, DC, USA (28 Oct 1979).

Separate abstracts are included for papers presented concerning research and development requirements and utility interface and institutional issues for small-scale systems; design requirements and research and development requirements for large-scale systems; economic and operational requirements of large-scale wind systems; wind characteristics and wind energy siting; international activities; wind energy applications in agriculture; federal commercialization and decentralization plans; and wind energy innovative systems.

32176 (CONF-791097—, pp 9-37) **Update on activities at Rocky Flats.** Williams, R. (Rockwell International, Golden, CO). Jun 1980.

From 4. biennial conference and workshop on wind energy conversion systems; Washington, DC, USA (28 Oct 1979).

The US Department of Energy's Small Wind Systems Program is formally titled Technical and Management Support for the Development of Small Wind Energy Conversion Systems. The management of this program is handled by the Rockwell International Energy Systems Group located at the Rocky Flats Plant near Golden, Colorado. Information is presented concerning the test center, the systems development activities, and the field evaluation program.

32177 (CONF-791097—, pp 75-97) **Large wind turbine projects.** Thomas, R.L.; Robbins, W.H. (Lewis Research Center, Cleveland, OH). Jun 1980.

From 4. biennial conference and workshop on wind energy conversion systems; Washington, DC, USA (28 Oct 1979).

The tecnology for large, horizontal-axis wind Turbines (100 kW to 2500 kW) has been under development since 1973 as a major part of the United States Wind Energy Program which is sponsored by the US Department of Energy by the Lewis Research Center of the National Aeronautics and Space Administration. Information is presented concerning the development status of large DOE wind turbines; wind turbine cost-of-electricity; and development assessment.

32178 (CONF-791097—, pp 99-117) **Preliminary analysis of performance and loads data from the 2 MW Mod-1 wind turbine generator.** Spera, D.A.; Viterna, L.A.; Richards, T.R.; Neustadter, H.E. (Lewis Research Center, Cleveland, OH). Jun 1980.

From 4. biennial conference and workshop on wind energy conversion systems; Washington, DC, USA (28 Oct 1979).

The DOE/NASA Mod-1 wind turbine generator installed on Howard's Knob near Boone, North Carolina, was dedicated on July 11, 1979. With a rated power of 2 MW and a rotor diameter of 61 meters, the Mod-1 is the largest wind turbine ever constructed. Initial operation during August, September, and October of 1979 has produced preliminary test data on output power versus wind speed, rotor blade loads, system dynamic behavior, and start/stop characteristics. These data have been analyzed statistically and are compared with design predictions of system performance and loads.

32179 (CONF-791097—, pp 119-135) **Summary of April 1979 workshop on large wind turbine design characteristics and research and development requirements.** Finnegan, P.M. (Lewis Research Center, Cleveland, OH). Jun 1980.

From 4. biennial conference and workshop on wind energy conversion systems; Washington, DC, USA (28 Oct 1979).

A workshop on Large Wind Turbine Design Characteristics and Research and Development Requirements was held in Cleveland, Ohio during April 24 to 26, 1979. The workshop was conducted by the NASA Lewis Research Center (LeRC) which is responsible to DOE for the development of large horizontal axis wind turbines. The workshop scope included both horizontal and vertical axis wind turbines (HAWT & VAWT) with Sandia Laboratories being responsible for the vertical axis portion of the workshop. The DOE objectives for the series of workshops were: (1) present the progress and significant results of ongoing projects sponsored by DOE; (2) provide a forum to facilitate the exchange of new ideas and information; and (3) provide an opportunity for in-depth discussion of specific issues confronting wind turbine developers as the technology moves closer to the goal of commercializtion.

32180 (CONF-791097—, pp 349-415) **Review of the wind energy innovative systems program.** Vas, I.E.; Mitchell, R.L. (Solar Energy Research Inst., Golden, CO). Jun 1980.

From 4. biennial conference and workshop on wind energy conversion systems; Washington, DC, USA (28 Oct 1979).

The responsibility to provide program management for the Wind Energy Innovative Systems program was authorized by the Wind Systems Branch, Department of Energy, during the latter part of FY78. The objective of the program is to determine the technical and economic feasibility of potentially cost competitive innovative systems. Technical monitoring of these studies is performed by SERI. All projects include theoretical thermodynamic and aerodynamic studies to confirm energy viability, and performance characteristics and capabilities. These initial studies are followed by model design and test, economic evaluation, and finally, the establishment of concept cost competitiveness.

32181 (CONF-791097—, pp 417-418) **Key issues associated with wind energy innovative systems.** Vas, I.E. (Solar Energy Research Inst., Golden, CO). Jun 1980.

From 4. biennial conference and workshop on wind energy conversion systems; Washington, DC, USA (28 Oct 1979).

A listing of qualifying aspects concerning the research activities for innovative wind turbines is presented.

32182 (PNL—3421) **Gust characteristics for WECS design and performance analysis.** Doran, J.C.; Powell, D.C. (Battelle Pacific Northwest Labs., Richland, WA (USA)). May 1980. Contract AC06-76RL01830. 76p. NTIS, PC A05/MF A01.

This document provides a description of some gust characteristics which are useful in the study of wind turbine fatigue caused by a fluctuating wind environment. The particular gust form chosen can also be used in the analysis of the dynamic response of a turbine. The statistical behavior of such gust characteristics is not identical to that determined simply from the wind recorded by an anemometer. These modes of behavior may be related, however, by the application of appropriate digital filters to the anemometer data. This procedure has been carried out for a number of sample cases, and the variations of the resultant gust features are presented. A number of suggestions on specific applications and interpretations of the data are included.

32183 (SERI/TR—98003-2) **Definitive generic study for the effect of high lift airfoils on wind turbine effectiveness. Executive summary. Final report.** Lissaman, P.B.S.; Wilson, R.E.; Thresher, R.W.; Walker, S.N. (AeroVironment, Inc., Pasadena, CA (USA)). May 1979. Contract EG-77-C-01-4042. 93p. NTIS, PC A06/MF A01.

The purpose of this project was to study the effect of high lift airfoils on the cost-effectiveness of HAWT and VAWT (horizontal and vertical axis wind turbine) machines. The scope involved first studying modern two-dimensional airfoils, and developing a generalized formulation for their performance in terms of lift, drag, and thickness at appropriate Reynolds numbers. Single element, multi-element, symmetrical, extra thick airfoils and jet flap airfoils were analyzed. The jet flap airfoils were considered to be unacceptable because of excessive power requirements. Then the effect of using the above airfoils on the rotors of a variety of wind turbines was made. A qualitative representation of the type of airfoils studied is given.

32184 **Characteristics and uses of wind machines.** Merriam, M.F. (Univ. of California, Berkeley). pp 665-718 of Solar energy technology handbook. Part A. Engineering fundamentals. Dickinson, W.C.; Cheremisinoff, P.N. (eds.). New York, NY; Marcel Dekker, Inc. (1980).

Information is presented concerning characteristics of wind machines; types of horizontel-axis machines; types of vertical-axis machines; uses of wind machines; and environmental aspects.

32185 **Performance matching and optimization of wind powered water pumping systems.** Bragg, G.M.; Schmidt, W.L. (Univ of Waterloo, Ont). *Energy Convers.;* **19**: No. 1, 33-39(1979).

A procedure is presented which allows optimum selection of pumps and windmills for a given water pumping situation. When information on the wind, pump characteristics and windmill characteristics is available, the best pump and windmill for the application may be selected, and the design and off-design performance of the complete system may be predicted. 7 refs.

SITE CHARACTERISTICS

REFER ALSO TO CITATION(S) 32165, 32168

ELECTRIC POWER ENGINEERING

POWER PLANTS AND POWER GENERATION

REFER ALSO TO CITATION(S) 32427

32186 (AD-A—075693) **Electrical energy in the Pacific Northwest. Final report 1975-1995.** Marshall, G.E. (Corps of Engineers, Seattle, WA (USA). Seattle District). Sep 1978. 54p. NTIS, PC A04/MF A01.

Electrical energy supply and demand forecasts for the Pacific Northwest region vary significantly depending on the assumptions, scenarios, and the forecasting methodology used. Unpredictable aspects of energy supply include (a) construction delays in proposed thermal power plants; (b) unexpected outages in existing thermal power plants; and (c) changing water and streamflow conditions affecting hydropower plants productivity. Forecasts of electricity demand (load forecasting) must consider hundreds of variables, most importantly population, personal income, number of households and energy prices. These factors, when applied to different forecast models, cause a variety of divergent results. In this booklet, five Pacific Northwest load forecasts are described, analyzed and compared. They are the (1) Pacific Northwest Utilities Conference Committee/west group area (PNUCC/West Group); (2) Pacific Northwest Utilities Conference Committee econometric forecast, (PNUCC/Econometric); (3) Northwest Energy Policy Project forecast, (NEPP); (4) Washington State University 'Energy projections for the Pacific Northwest', (WSU); and (5) National Resources Defense Council Forecast (NRDC). Input assumptions and forecasting methods (trend analysis, end use analysis and econometrics) used for each projection are analyzed in light of the influence they have on the resulting forecast.

32187 (DOE/NASA/0030—80/6) **Cogeneration technology alternatives study (CTAS). Volume IV. Heat sources, balance of plant and auxiliary systems. United Technologies Corporation final report.** (United Technologies Corp., South Windsor, CT (USA). Power Systems Div.). Jan 1980. Contract AI01-77ET13111. 297p. (NASA-CR—159764). NTIS, PC A13/MF A01.

The Cogeneration Technology Alternatives Study (CTAS) provides data and information in the area of advanced energy conversion systems for industrial cogeneration applications in the 1985 to 2000 time period. Six current and thirty-one advanced energy conversion systems were defined and combined with appropriate balance-of-plant equipment. Twenty-six industrial processes were selected from among the high energy consuming industries to serve as a frame work for the study. Each conversion system was analyzed as a cogenerator with each industrial plant. Fuel consumption, costs, and environmental instrusion were evaluated and compared to corresponding traditional values. Various cogeneration strategies were analyzed and both topping and bottoming (using industrial by-product heat) applications were included. The advanced energy conversion technologies indicated reduced fuel consumption, costs, and emissions. Typically fuel energy savings of 10 to 25 percent were predicted compared to traditional on-site furnaces and utility electricity. With the variety of industrial requirements, each advanced technology had attractive applications. Overall, fuel cells indicated the greatest fuel energy savings and emission reductions. Gas turbines and combined cycles indicated high overall annual cost savings. Steam turbines and gas turbines produced high estimated returns. In some applications, diesels were most efficient. The advanced technologies used coal-derived fuels, or coal with advanced fluid bed combustion or on-site gasification systems. This volume presents heat source, balance-of-plant, and plant design information developed by Bechtel National, Incorporated; heat storage data developed by Rocket Research Company; and heat pump information developed by Power Systems Division United Technologies with the advice of Westinghouse Electric Company.

COOLING AND HEAT TRANSFER EQUIPMENT AND SYSTEMS

32188 (EPRI-EA—1111(Vol.4)) **Methodology for evaluation of multiple power-plant-cooling system effect. Volume IV: User's guide to model operation. Final report.** (Tetra Tech, Inc., Lafayette, CA (USA)). Aug 1980. 275p. NTIS, PC A12/MF A01.

The models developed can be used to evaluate the impact of multiple-power-plant cooling systems on the ecosystem of a single body of water. The models are designed to simulate the behavior of a simplified ecosystem with stress from cooling-system operation. The ecosystem is simulated in terms of water withdrawal, passage of the water through the plant (with different induced-mortality rates), and discharge back to the ecosystem. The specific formulations and rate constants represent the best synthesis of ecosystem knowledge. The computer programs were written so that users can input site- or species-specific information where appropriate, or may choose to use default values contained in the methodology for sensitivity analysis or when no better information is available. The value of the methodology lies in its ability to consider a large number of interacting processes simultaneously. The specific formulations and constants can be easily respecified. Algorithms can be changed easily to reflect new information on ecosystems. By considering state variables and processes in an aquatic ecosystem, the methodology is particularly suited to comparing alternatives, determining sensitivity, and testing

hypotheses. This volume (IV) contains quidance for applying the models to specific situations. The equations and rationale for relationships are contained in earlier volumes (I, II, and III), but this volume contains sufficient information to use the models. Volume V provides an example application of the methodology for Cayuga Lake, New York, as the prototype.

32189 (P—300-80-022) **Agricultural waste water as a potential source of cooling water for California electric power plants.** MacDonald, T.; Wire, C. (California Energy Commission, Sacramento (USA)). May 1980. 98p. California Energy Commission, Sacramento, CA.

The potential of agricultural waste water in California to serve as a source of cooling water for new power plants is described, and the considerations which influence the viability of this alternative are discussed. It includes summaries of investigations of agricultural waste water use that were undertaken in conjunction with three different power plant proposals. Before agricultural waste water can be considered an available and preferred source of cooling water supply for a significant portion of the state's future power plants, several problems and uncertainties need to be resolved. In the San Joaquin Valley, installation of on-farm tile drains and a valley-wide waste water collection system remains to be accomplished. The diversion of agricultural waste water flowing to the Salton Sea in the Imperial Valley faces objections from interests seeking to protect the Sea's fishery and wildlife resources. Waste water returned to the Colorado River is not available for use unless the River's flow is augmented by an equivalent amount of water from another source. In addition to the above concerns, which are specific to waste water flows in individual regions, there are some general constraints to the use of waste water for power plant cooling. These include problems with disposal of the concentrated cooling system waste water (blowdown), saline aerosol emissions from cooling towers, cost and reliability of necessary waste water treatment, and difficulty in finding suitable power plant sites in agricultural areas.

POWER CYCLES

REFER ALSO TO CITATION(S) 31466

32190 (EPRI-CS—1451) **Preliminary assessment of alternative PFBC power plant systems. Final report.** Wysocki, J.; Rogali, R. (Burns and Roe, Inc., Woodbury, NY (USA)). Jul 1980. 114p. NTIS, PC A06/MF A01.

This report presents the design and and economic comparisons of the following nominal 1000 MWe PFBC power plants for both eastern and western coal: Curtiss-Wright PFBC power plants with an air-cooled design; General Electric RFBC power plants with a steam-cooled design; and AEP/Stal-Laval PFBC power plants with a steam-cooled design. In addition, reference pulverized coal-fired (PCF) power plants are included for comparison purposes. The results of the analysis indicate: (1) The steam-cooled PFBC designs show potential savings of 10% and 11% over PCF plants for eastern and western coal, respectively, in terms of busbar power cost; (2) the air-cooled PFBC designs show potential savings of 1% and 2% over PCF plants for eastern and western coal, respectively, in terms of busbar power cost.

32191 (FE—2357-39) **PFB Coal Fired Combined Cycle Development Program. Advanced hot gas cleanup concept evaluation (Task 4.3). Volume A. Aerodyne cyclone evaluation.** (General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.). Feb 1980. Contract AC01-76ET10377. 92p. NTIS, PC A05/MF A01.

This report summarizes the results of testing of a rotary flow cyclone, manufactured by Aerodyne Development Corporation under license by Siemens Kraftwerk Union. This cyclone was selected for evaluation due to the unusually high separative efficiencies claimed by the manufacturer (based on developer data), and relative lack of open literature data. The most significant finding of this work was the observation that electrostatic forces could enhance or, in fact, dominate the separation process. Separative efficiencies, with electrostatic forces present, were found to be substantially independent of flow rate and, by inference, could be independent of unit size. Hence this finding offers a major hope that large cyclones employed in the hot gas cleanup train of the CFCC system may not suffer the performance degradation compared to small cyclones, as projected from conventional inertial theory. The separative efficiencies of the Aerodyne cyclone separator were found from both the cold flow and the hot flow tests to be disappointingly poorer than expectations (in agreement with Westinghouse results), and even poorer than conventional cyclones. (LTN)

32192 (FE—2357-70) **PFB Coal Fired Combined Cycle Development Program. Advanced cleanup device performance design report (Task 4.3). Volume B. Air shield cyclone evaluation.** (General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.). Mar 1980. Contract AC01-76ET10377. 61p. NTIS, PC A04/MF A01.

The purpose of this experimental program was to obtain performance data on a twelve-inch diameter model of the air-shield cyclone. The efficiency results were extremely high, independent of whether or not the air shield feature was operative. In particular, substantially higher performance was obtained than reported in the literature for a Stairmand high-flow cyclone design, which has some features in common with the model. The reason for the high performance without the air shield is attributed to a strong space charge effect which can be a much stronger influence when there is no air shield. Overall efficiency, fractional efficiency and pressure loss measurements have been obtained during cold-flow testing of the air-shield cyclone model and also with the unit arranged to simulate a more conventional cyclone design. Pressurized fluidized bed flyash and powdered nickel, both having a mass mean particle size of about 2 μm, were used as test dusts. Inertial forces appeared to dominate the performance of the air-shield cyclone over the entire range of flow rates tested. Fractional efficiency results correlated well with the inertial parameter, psi. Air-shield cyclone performance data confirmed earlier projections that efficiency would be an-order-of-magnitude better than published results on conventional cyclones.

WASTE-FUELED SYSTEMS

REFER ALSO TO CITATION(S) 31849

32193 (EPRI-AP—1403) **Feasibility study of wood-residue-fired cogeneration at Heppner, Oregon. Final report.** Albaugh, E.W.; Collins, D.A.; Alescio, R.J. (Schuchart and Associates, Inc., Seattle, WA (USA)). Apr 1980. 337p. NTIS, PC A15/MF A01.

This study explores the technical and economic feasibility of constructing a wood residue-fired steam and electric power cogeneration facility on a site near Heppner, Oregon. The availability and cost of wood residue from various sources were investigated. Three plants at capacities of 6 MW, 12 MW, and 24 MW were studied with 45,000 lb/h of extraction steam supplied to the Kinzua mill for each plant. Capital and operating costs were estimated for each plant together with bus bar power costs, and economic analyses were performed for four financing/ownership cases for each. Finally, the feasibility of marketing power at these bus bar costs was determined. It was concluded that: sufficient fuel is available at a range of costs for any one of the plants studied; conventional proven designs exist to support construction of these facilities. The lowest cost of electricity is obtained by matching plant capacity with wood residue supply from Kinzua operations; structuring of plant ownership and project financing to take maximum advantage of tax incentives and tax-exempt bonds has a significant effect on electricity costs; utilization of waste material brought in from forests significantly increases the cost of electricity, compared with plants using wood residue available from wood processing operations; and electricity from plants with capacities which can be supported by wood residues from mill operations is competitive with alternative new sources of electricity which will be available in the 1980's. Use of existing tax incentives and tax-exempt financing, when possible, greatly enhance the economic justification for such plants.

COMPONENTS

32194 (EPRI-CS—1440) **Dynamics of power plant fan-foundation systems. Final report.** Medearis, K. (Medearis (Kenneth) and Associates, Fort Collins, CO (USA)). Jul 1980. 102p. NTIS, PC A06/MF A01.

The vibratory responses of large fan systems continues to be a problem at numerous power plants. Tlis research study has provided further insight concerning methods of analyzing and predicting such responses. In general, no unified approach has been utilized for the dynamic analyses. As a result, the fan manufacturer is blamed on the premise the fan system is deficient, and/or the utility or its engineer on the basis the supporting foundation is unsatisfactory. Vibration problems are usually related to the dynamic characteristics of the total system rather than to individual components. Further refinement and verification of the total system dynamic analysis procedures was accomplished in the investigation. The equivalencing of experimental measurements taken on existing fan systems with theoretical response results provided one of the bases for this effort. Five large, induced-draft fans and two smaller, primary air fans were utilized for the comparisons, good agreement being obtained in all cases. Primary air fans have rarely been given major consideration from a vibration standpoint, but it is now being recognized that they not-infrequently constitute a major problem to power plant operations. Further insight was gained in regard to ranges of values for pertinent system parameters, including soil stiffness and damping. Bearing oil film stiffness and damping coefficients were studied on a limited basis. Manufacturers values for these coefficients have occasionally been found to be significantly in error. Stiffness values for the steel bearing pedestals are also considered herein. Progress has been, and is being made, but further study is clearly required. It is imperative to recognize that related past experience is, in some cases,

of questionable value. The acceptance of new, improved concepts is deemed to be of significant value to the power industry.

WASTE HEAT UTILIZATION

REFER ALSO TO CITATION(S) 32502

ECONOMICS

32195 (DOE/EIA—0191(79)) **Cost and quality of fuels for electric utility plants, 1979. Energy data report.** Rhodes, S. (Department of Energy, Washington, DC (USA). Energy Information Administration). Jun 1980. 96p. NTIS, PC A05/MF A01.

Subject data are summarized for fossil fuels delivered to electric utility plants in the US (the 50 states and the District of Columbia) with a combined capacity of 25 MW or greater. Plant-by-plant data are grouped on a state and regional basis to compare prices of similar fuels delivered to other plants in the same state and region. In 1979, the production of electric energy rose 1.8%, reaching a new record of 2,247 billion kWh. The biggest increase in electric generation occurred in coal plants which produced 1,076 billion kWh, or 47.9% of the total. Coal generation increased 10.1% from the 1978 level. The second largest increase in electric generation came from gas units, increasing to a level of 330 billion kWh, an increase of 8.2% from 1978. Coal and gas generation made up for the 17% decrease in oil generation and the 7.6% decrease in nuclear generation, as some nuclear plants, such as Three Mile Island and Surry, stopped generation during the year. Oil generation decreased 16.8% from last year, mainly due to the high price of residual oil.

OFF-PEAK ENERGY STORAGE

32196 (ANL—80-19) **Reference design of 100 MW-h lithium/iron sulfide battery system for utility load leveling.** Zivi, S.M.; Kacinskas, H.; Pollack, I.; Chilenskas, A.A.; Barney, D.L.; Grieve, W.; McFarland, B.L.; Sudar, S.; Goldstein, E.; Adler, E. (Argonne National Lab., IL (USA); Rockwell International Corp., Palo Alto, CA (USA). Energy Systems Group). Mar 1980. Contract W-31-109-ENG-38. 48p. NTIS, PC A03/MF A01.

The first year in a two-year cooperative effort between Argonne National Laboratory and Rockwell International to develop a conceptual design of a lithium alloy/iron sulfide battery for utility load leveling is presented. A conceptual design was developed for a 100 MW-h battery system based upon a parallel-series arrangement of 2.5 kW-h capacity cells. The sales price of such a battery system was estimated to be very high, $80.25/kW-h, exclusive of the cost of the individual cells, the dc-to-ac converters, site preparation, or land acquisition costs. Consequently, the second year's efforts were directed towards developing modified designs with significantly lower potential costs.

32197 (EPRI-EA—1411(Vols.1-2)) **Probabilistic simulation of multiple energy storage devices for production cost calculations. Final report .** Manhire, B. (Ohio Univ., Athens (USA). Dept. of Electrical Engineering). May 1980. 280p. NTIS, PC A13/MF A01.

A computationally feasible probabilistic production cost model capable of evaluating the impact on the operating cost of an electric utility of multiple energy storage technologies such as pumped-storage hydroelectric, storage batteries, cryogenic storage, flywheels, and gas turbines utilizing compressed air storage is described. The model is capable of simulating the complex interactions of individual units of each storage technology with the remaining units, both storage and nonstorage, of the power system. Operating characteristics of the various energy storage technologies including forced outage rates, cycle efficiencies, fuel characteristics, and storage capability constraints are considered in the model as well as differences between these characteristics among individual units within each storage technology. The model is oriented toward - but not restricted to - the Wien Automatic System Planning Package (WASP), a widely used generation system expansion planning model. In addition to the multiple energy storage technology capability, the model is able to simulate individually, multiple generting units whose energy is preassigned; e.g., conventional hydroelectric units.

ENVIRONMENTAL ASPECTS

REFER ALSO TO CITATION(S) 32821, 32822, 32823, 32824

32198 (EPRI-CS—1464) **Environmental and chemical analysis technician curriculum planning guide. Final report.** Hull, D.M.; Rinard, B.F. (Center for Occupational Research and Development, Waco, TX (USA)). Jul 1980. 279p. NTIS, PC A13/MF A01.

The Environmental and Chemical Analysis Technician (ECAT) Curriculum Planning Guide is one of three such guides developed as part of project RP 1266-6, Educational Research in Solid-Fuel Technology. The first phase of the project included a needs assessment survey to determine the number of entry-level employees required as Environmental and Chemical Analysis Technicians. The need for 2900 technicians over the next decade warrants the development of a specialized ECAT curriculum. A detailed task inventory of the skills and knowledge used by Environmental and Chemical Analysis Technicians in the safe and efficient performance of their jobs has been completed. The task inventory forms the basis for the model two-year (six quarter) curriculum presented in this document. Course and module outlines are included which have been formulated to provide students with entry-level skills and the background necessary for further advancement.

32199 **Draft environmental impact statement. Underwood generating station units 1 and 2 and related transmission lines (information supplement to final statement of January 1977).** Washington, DC; Department of Agriculture (1979). 17p. (USDA-REA-EIS(ADM)—73-10-F). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC (MF or HC) 79-0548.

Revision of a previously proposed transmission line route in Minnesota, associated with transmission facilities for the Underwood Generating Station in North Dakota, is described. This information supplement to the January 1977 final environmental impact statement pertains to the 75 miles of 345-kilovolt transmission line from the Dickinson substation near Delano to the Wilmarth substation near Mankato, Minnesota. It describes certain differences between the routing as proposed in the original statement by the Rural Electrification Administration and the routing subsequently selected by the Minnesota Environmental Quality Board. The approved route would cross a rural instead of an urban area and would use a different pole design. It would be longer, traverse more wetlands and woodlands and less productive farmlands, and affect more residences than the original route.

32200 **Draft environmental impact statement. Western farmers coal-fired power plant and associated transmission.** Washington, DC; Department of Agriculture (1978). vp. (USDA-REA-EIS(ADM)—78-9D). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 78-0937.

Construction and operation of a new 400-megawatt (MW) coal-fired, steam-electric-generating plant in southeastern Choctaw County, Oklahoma are proposed by the Western Farmers Electric Cooperative. The proposed plant is scheduled to commence operation in April 1982. Fuel would be obtained from the Powder River Basin in eastern Wyoming and would be transported to the station by unit-train. Combustion control techniques would be applied to reduce nitrogen oxide formation, and boiler flue gases would be treated for particulate removal by use of electrostatic precipitators. Sulfur dioxide emissions would be controlled by use of low-sulfur coal. Water would be supplied from the Hugo Reservoir via the Kiamichi River and would be discharged into the Red River. Cross-flow, induced-draft cooling towers would be used. Transmission facilities would include 18 miles of 345-kilovolt (kV) line and approximately 11 miles of 138-kV line.

32201 **Draft environmental impact statement. Ojo-Taos, New Mexico, 345-KV transmission line and related terminal facilities.** Washington, DC; Department of Agriculture (1978). vp. (USDA-REA-EIS(ADM)—78-13). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC (MF or HC) 79-0329.

Construction of 38 miles of 345-kilovolt (kV) transmission line between Ojo and Taos in Taos and Rio Arriba counties, New Mexico is proposed. Project features would include construction of 6.6 wooden, two-pole K-frames per mile within a new right-of-way of 150 feet; suspension of a single circuit line comprised of two nonreflective conductor bundles per phase; construction of an additional tower structure at the Ojo substation; and a 15-acre expansion of the Taos substation, including transformer banks, tower structures, and fencing. The two alternative alignments would be constructed parallel and adjacent to the existing 115-kV line except to either a four-mile segment at the southern end or a 10-mile segment at the northern end. The proposed facility would be energized at 155 kV for approximately five years and later would be converted to 345 kV as required.

32202 **Draft environmental impact statement. Stanton generating station: one 60-MW supplemental steam generator.** Washington, DC; Department of Agriculture (1978). vp. (USDA-REA-EIS(ADM)—78-3-D). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC (MF or HC) 78-0938.

Addition of a supplemental 60-megawatt steam generator to the United Power Association's coal-fired Stanton Generating Station in Mercer County, North Dakota is proposed. The new generator would be fueled by lignite, and emissions would be controlled by sulfur dioxide and particulate removal systems. The generator also would be designed and operated to control the emission of nitrogen oxides. Cooling water for the condenser tubes would be drawn from the Missouri River. The primary fuel would come from

the nearby Indian Head Mine, the present source of fuel for the plant.

THERMAL EFFLUENTS

REFER ALSO TO CITATION(S) 32188

NOXIOUS GAS AND PARTICULATE ABATEMENT AND CONTROL

REFER ALSO TO CITATION(S) 31524, 31549, 31552

32203 (P—300-80-003) **Air pollution control device configurations.** (Acurex Corp., Mountain View, CA (USA)). Mar 1980. 49p. California Energy Commission, Sacramento.

An analysis of those candidate air pollutant abatement schemes identified previously by Acurex Corporation in the report Environmental Control Technologies for a Northern California Coal-Fired Power Plant (300-039) for possible use of PG and E's proposed Montezuma 1 and 2 (previcusly called Fossil 1 and 2) electric generating plants is presented. Emphasis is placed on the effects of the arrangement of the control components, namely the baghouse, selective catalytic reduction (SCR), and flue gas desulfurization units. Three basic configurations were identified as workable arrangements. The configurations were analyzed with respect to their capital, operating and maintenance cost impacts, reliability implications, and overall system removal efficiencies. Since there is no actual experience reported for these configurations with coal-fired boilers, reliability and overall efficiency estimates were described qualitatively.

POWER TRANSMISSION AND DISTRIBUTION

REFER ALSO TO CITATION(S) 32405, 32412, 32413, 32576

32204 (COO—5013-6) **Fundamentals of interruption in vacuum. Sixth progress report.** Greenwood, A.N.; Childs, S.E. (Rensselaer Polytechnic Inst., Troy, NY (USA). Center for Electric Power Engineering). Nov 1979. Contract AC02-78ET29197. 89p. NTIS, PC A05/MF A01.

A theoretical model, describing events in the interelectrode gap of a vacuum interrupter, from the steady state to the post-arc period, is proposed. The time sequence of events is divided into two periods: the commutating period from steady state to current zero, and the post-arc period immediately following current zero. Equations are developed for these periods based on such considerations as conservation of mass, charge, energy and momentum, and the known interactions of particles of different species. These equations predict the formation of a positive ion sheath adjacent to the former anode, and its propagation across the gap. They also permit the computation of electric field at this electrode and the energy input by ion bombardment. It is believed that these are critical factors in the establishment of a cathode spot which can lead to reignition and failure. Numerical solutions for the post-arc period have already been obtained. A test facility has been put in place to provide a check on the validity, or otherwise, the theoretical work.

32205 (DOE/RA/3291—01) **Transformer requirements for the year 2000. Final report, December 1979.** (Westinghouse Electric Corp., Pittsburgh, PA (USA)). Jun 1980. Contract ET-78-C-01-3291. 203p. NTIS, PC A10/MF A01.

The principal objective of this program was to determine the design parameters required for transformers of the year 2000. The approach to meeting this objective was to determine the changes which may occur in transmission and distribution systems over the next twenty years, and how these changes might affect design parameters of distribution and power transformers. Emphasis was placed on domestic requirements, although the impact of international practices was factored into the overall requirements for transformers. Possible investigations that could help transformer designers meet the long term technical requirements of future transformers were also identified. The principal conclusions of this study were: 1200 kV transmission could be in service by the late 1980's and it is essential to develop 1200 kV transformers for these systems; transformer manufacturers must be prepared to supply higher MVA ratings at all voltage levels; there will be a strong demand for low-loss, minimum cost transformers; and environmental/safety, reliability, and size reduction considerations will increase in importance. (LLL)

32206 (EPRI-EL—1358) **SF_6/oil dielectric for power transformers. Final report.** Walsh, E.J.; Robinson, J.A.; Wendel, R.C. (Westinghouse Electric Corp., Sharon, PA (USA)). Mar 1980. 114p. NTIS, PC A06/MF A01.

This project was designed to evaluate the potential for providing a superior gas-oil insulating and cooling system for liquid filled transformers. The potential benefits of using the electronegative gases, sulfur hexafluoride, SF_6, or hexafluorethane, C_2F_6, in place of nitrogen gas normally used in gas-oil filled transformers were examined. A test program involving electrical, chemical, and physical properties indicated that the SF_6-oil combination appeared satisfactory as an insulating medium. No short term reduction in insulating or cooling capacity was determined for SF_6-oil filled transformers. However, some of the results obtained in the longer term transformer testing using SF_6 gas and oil indicated that due to accelerated formation of combustible gases and carbon dioxide; prolonged exposure of currently designed transformers to SF_6 is to be avoided. It was determined that due to the high degree of solubility of SF_6 in transformer oil, degassing under thermal or electrical stress could result in extensive bubble formation. It was determined, however, that under our test conditions, SF_6 gas bubbles did not reduce the insulating capacity of the liquid medium as did nitrogen gas bubbles under the same test conditions. As a result of this study, many previously unknown areas concerning electronegative gas-oil systems have been clarified but the results from these studies have given rise to some new concerns for allowing SF_6 to enter existing oil filled transformers. Based on the observations of increased bubble formation and accelerated formation of combustible gases, predominantly hydrogen, it is recommended that existing oil filled transformers not be exposed to SF_6 for longer periods of time.

32207 (TR-EE—8010) **Comparison of short term electric power load forecasting methods.** Kaur, B. (Purdue Univ., Lafayette, IN (USA). School of Electrical Engineering). Feb 1980. 100p. (PCTR—90-80). Purdue Univ., West Lafayette, IN.

Accuracy of short term load forecasts is essential for a real-time control center and any increase in accuracy will tend to decrease the necessary spinning reserve, i.e., operating costs and step-up costs. To achieve good quality of short term load forecasts, various methods of load forecasting are discussed and their advantages and disadvantages are outlined. Out of those techniques, time series, models, i.e., sine series model and Fourier series model and state estimation and Kalman-filtering technique have been selected for critical examination, and comparative analysis based on same set of actual load data. These three models/methods are discussed in detail. Techniques of selecting fitting functions, finding harmonics to be included in the fitting functions, and updating the harmonic coefficients in those methods are also described. Computer programs for all these methods have been developed, and comparison of forecasts made by these methods on same set of load data is also discussed. Finally, the conclusions of the study are summarized and recommendations for further improvements are made.

AC SYSTEMS, EHV AND UHV

32208 (EPRI-EL—1384) **Development of power poles from fly ash. Phase 2. Final report, April 1980.** (ECP, Inc., El Segundo, CA (USA)). 1980. 155p. NTIS, PC A08/MF A01.

A study to develop a continuous manufacturing process to produce full-size power poles made from fly ash at a competitive price is described. The activity had two major thrusts: to develop a continuous process for the production of fly ash power poles; and to produce a full size 40-foot long power pole. The development of the material composition, pole design, equipment design and fabrication, the manufacturing process, and the establishment of a pilot plant facility to demonstrate the capability for fabricating suitable power poles using fly ash with the basic concept of cost effective resource recycling are discussed in detail.

32209 (EPRI-EL—1396) **Prototype fault current limiter. Final report.** Kroon, P.J.; Johnson, S.A.; Welk, S. (Gould-Brown Boveri, Colmar, PA (USA)). May 1980. 119p. NTIS, PC A06/MF A01.

The development of a switched-resistor fault current limiter for an application at 69 kV, 2000 A, with an available fault current level of 6350 A rms is described. Full-power tests on a single phase prototype repeatedly demonstrated successful first loop peak limitation with resistor insertion within 3 to 4 milliseconds from fault initiation. Resistor insertion is accomplished with a two-step current commutation scheme. The current is transferred from a normally closed-bypass switch to a silver-sand commutating fuse, which commutates the current to the resistor. A high speed fault sensor was developed to discriminate faults rapidly using di/dt and a transient-filtering time delay. High speed, chemically activated bypass and fuse switches were used to perform the switching functions. The 10-ohm resistor uses magnesium oxide filled tubing as the resistive element to provide 90-megajoule energy absorption capability with rapid cool-down. Prototype component designs and tests are described. Improvements in the design of the bypass switch are suggested to provide a fail-safe feature. Further investigation into alternate commutating devices is recommended to eliminate some or all of the expendable devices in the present design and simplify the commutation process for application in future fault current limiters

DC SYSTEMS

32210 (DOE/ET/29054—1) **Development of a HVDC prototype breaker. Final report.** Damsky, B.L.; Barkan, P.; Imam, I.; Permerlani, W.; Anderson, J.M.; Carroll, J.J.; Hudson, J.E.; Pohl, R.V.; Solberg, W.D.; Sharbaugh, A.H. (General Electric Co., Schenectady, NY (USA). Electrical Systems and Technology Lab.). Jun 1980. Contract AC01-76ET29054. 287p. NTIS, PC A13/MF A01.

The significant design features of a high-voltage dc (HVDC) circuit breaker based on the commutation concept were developed. Tests of components indicate the breaker is capable of interrupting a fault current of 10 kA on a 400 kV system and absorbing up to 10 MJ of system energy without generating more than 1.6 per unit (P.U.) voltage of the system. Interactions of the breaker with a three-terminal network were studied, using a system simulator. An ultrafast hydraulic actuator system was developed for this program which enables the breaker to initiate the current limiting process within 5 ms after receipt of a trip signal. A new hydraulic valve, operated by a repulsion coil, minimizes the delay before motion begins. Interruption will occur in series-connected vacuum interrupters. A 400 kV circuit breaker is estimated to require eight breaks in series. Only a single break was tested as part of this program because of the scale and cost required for multibreak tests. System energy will be absorbed by zinc-oxide-based surge suppressors included as an integral part of the breaker. The overall design is envisioned as a dead tank type using pressurized SF_6 gas as a dielectric medium. The actuator and all control functions are located at ground potential, with easy access for inspection or adjustment. Operational specifications have been carried over from NEMA standards for ac power circuit breakers where applicable. The cost of one pole of this circuit breaker, when in regular production, has been estimated as two times the cost of a three-phase 500 kV ac circuit breaker.

32211 (EPRI-EL—1386) **Extruded dielectric dc cable development. Final report.** Kierszтyn, S.E.; MacKenzie, B.T. (General Electric Co., Bridgeport, CT (USA)). Apr 1980. 276p. NTIS, PC A13/MF A01.

The development of an extruded 100-kilovolt (kV), direct-current (dc) cable insulated with mineral-filled polymeric dielectrics is described. Analysis of the factors controlling the rated stress and load limits indicated that capabilities of an extruded dc cable could be improved by reducing the dependency of electrical resistivity on temperature and the thermal resistivity of the dielectrics. It was experimentally determined that these two properties of extrudable polymers can be suitably modified by introduction of mineral fillers. Insulation efforts produced a family of candidate compounds exhibiting the desirable characteristics. Screening tests conducted on slab samples, insulated wires, and full-size experimental cables resulted in selecting a mineral-filled, cross-linked polyethylene compound, and a prototype 100-kV dc cable was manufactured. In addition to the the mineral-filled prototype, a reference cable insulated with conventional unfilled cross-linked polyethylene was made. Both cables were designed to meet the same operational requirements. The prototype and reference cables, connected in series, were subjected to the CIGRE dc cable qualification test, but failed it. However, the posttest examination disclosed multiple punctures in both cables, and it was not possible to conclude which cable initiated the failure of the series-connected cable system. The unfilled polyethylene reference cable was then retested alone and failed. Because of insufficient quantity of the original prototype, a mineral-filled, 35-kV ac cable from commercial production was selected as a substitute and subjected to and passed the CIGRE test. These results indicate that a mineral-filled, cross-linked polyethylene compound is a promising dielectric for extruded dc-power cable application.

NUCLEAR POWER PLANTS

REFER ALSO TO CITATION(S) 32384

32212 (DOE/TIC—8200-R41) **Nuclear reactors: built, being built, or planned in the United States as of Dec 31, 1979.** (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Jul 1980. 47p. NTIS, PC A02/MF A01.

Information is tabulated in nuclear reactor and critical assembly facilities in operation, shut down, under construction, or planned. The data include name, owner, location, type, power, and startup date.

32213 **Reactor based on a magnetohydrodynamically driven supersonic gas vortex.** Kistemaker, J. (to Ultra Centrifuge Nederland N.V.). US Patent 4,174,256. 13 Nov 1979. Priority date 29 Oct 1975, Netherlands, 8p.

Nuclear reactor with a MHD driven gas-core vortex is described which may be preceded by an enrichment section and followed by a reprocessing section, both sections based on gas-cores that are MHD driven gas-vortexes, in which the nuclear reactor functions with a mixture of e.g. UF_6 and one or more light gases such as H_2, DT, He.

POWER REACTORS, NON-BREEDING, LIGHT-WATER MODERATED, BOILING WATER COOLED

REFER ALSO TO CITATION(S) 31672, 32260, 32267, 32314, 32315, 32322, 32324, 32325, 32326, 32327, 32329, 32592

32214 (GEAP—25093) **Behavior of unirradiated zirconium-lined and copper-plated Zircaloy-2 tubing under simulated PCI conditions.** Gangloff, R.P. (General Electric Co., Schenectady, NY (USA). Corporate Research and Development Dept.; General Electric Co., San Jose, CA (USA). Nuclear Engineering Div.). Nov 1979. Contract AC02-77QQ04473. 109p. NTIS, PC A06/MF A01.

The expanding mandrel technique was employed to evaluate the fracture resistance of unirradiated, cold-worked zirconium and copper barrier fuel cladding for simulated pellet-cladding interaction (PCI) conditions. A range of environment and loading conditions, shown to produce severe embrittlement of cold-worked Zircaloy-2 and including 4 Pa I_2, pure cadmium and molten cadmium-saturated cesium, was employed for barrier screening.

32215 (K/ET—5016) **Noble gas removal system for post-accident decontamination of power reactors.** Stephenson, M.J.; Kanak, B.E.; Little, D.K.; Merriman, J.R.; Riepe, R.C. (Oak Ridge Gaseous Diffusion Plant, TN (USA)). May 1980. Contract W-7405-ENG-26. 22p. (CONF-800802—8). NTIS, PC A02/MF A01.

From 89. annual meeting of the American Institute of Chemical Engineers; Portland, OR, USA (17 Aug 1980).

Oak Ridge has developed a noble gas removal system, as part of the Consolidated Fuel Reprocessing Program, that could be used to help decontaminate the containment vessel of a power reactor following core release of fission gas in the event that containment venting is judged to be unacceptable. The system is based on a fluorocarbon selective absorption process, which has been well demonstrated on an engineering scale with over 10 years of pilot plant operation.

32216 (LBL—10351) **Sloshing of liquids in rigid annular cylindrical and torus tanks due to seismic ground motions.** Aslam, M.; Godden, W.G.; Scalise, D.T. (Bechtel Corp., San Francisco, CA (USA); California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Jan 1980. Contract W-7405-ENG-48. 9p. (CONF-800919—2). NTIS, PC A02/MF A01.

From 7. world conference on earthquake engineering; Istanbul, Turkey (8 Sep 1980).

Sloshing response and impulsive hydrodynamic pressures in rigid axisymmetric tanks due to horizontal ground motions are predicted by theoretical solutions based on series and finite element analysis. Results are compared with experimental data from model tests conducted on a 20 ft x 20 ft earthquake simulator.

32217 (UCRL—82217) **Three-dimensional linear analysis of fluid-structure interaction effects in the Mark I BWR pressure suppression torus.** Holman, G.S.; McCauley, E.W.; Lu, S.C. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 15 Jan 1980. Contract W-7405-ENG-48. 7p. (CONF-800804—11). NTIS, PC A02/MF A01.

From ASME century 2 emerging technology conference; San Francisco, CA, USA (10 Aug 1980).

Most analytical and experimental approaches to the evaluation of fluid-structure interaction (FSI) effects in the General Electric Mark I BWR pressure suppression system treat the torus shell as rigid when the shell in real systems is flexible. This report describes linear three-dimensional finite-element analyses of one torus bay that investigated the qualitative effect of torus wall flexibility on hydrodynamic loads induced by a nominal safety relief valve (SRV) discharge. The results of these analyses support the general conclusion drawn from earlier two-dimensional analyses. The report also discusses finite-element analyses of a 3-D representation of the earlier 2-D plane-strain model of the torus shell.

POWER REACTORS, NON-BREEDING, LIGHT-WATER MODERATED, NON-BOILING WATER COOLED

REFER ALSO TO CITATION(S) 32215, 32260, 32267, 32284, 32310, 32312, 32313, 32314, 32315, 32321, 32322, 32325, 32326, 32327, 32592

32218 (BAW—1546-2) COO—4711-24. **Qualification of the B and W Mark B fuel assembly for high burnup. Second semi-annual progress report, January-June 1979.** (Babcock and Wilcox Co., Lynchburg, VA (USA). Nuclear Power Generation Div.; Babcock and Wilcox Co., Lynchburg, VA (USA). Research and Development Div.). Dec 1979. Contract AC02-78ET34212. 87p. NTIS, PC A05/MF A01.

Five Babcock and Wilcox-designed Mark B (15 x 15) pressurized water reactor (PWR) fuel assemblies are being irradiated to extended burnups in Duke Power Company's Oconee Unit 1 reactor. This effort is part of a Department of Energy-sponsored program to improve uranium utilization by extending the burnup of light water reactor fuel. This report, covering the January-June 1979 period, is the second semi-annual progress report for the program. Efforts during this period included reduction and analysis of the post-irradiation examination data, performance tracking of the extended burnup assemblies during their fourth cycle, and analytical work to identify and quantify those factors limiting fuel assembly lifetime.

32219 (EGG/LTR-LO—00-80-117) **Measurement of velocity vectors in two-phase flows using five hole stagnation probe.** Deason, V.A.; Fincke, J.R. (EG and G Idaho, Inc., Idaho Falls (USA)). 6 Jun 1980. Contract AC07-76ID01570. 35p. NTIS, PC A03/MF A01.

A flow mapping technique has been developed using a prototype five-point stagnation probe. The five-point probe produces five separate differential pressure measurements which can be combined with a density determination to resolve the three-dimensional fluid velocity vector at the probe tip. Modeling and calibration techniques for determining the local velocity vector, and data from a single-phase calibration are presented. Extension of the technique to two-phase flow calibration is discussed and two-phase data are evaluated. This probe can be used to map two phase flow fields in complex piping configurations where bends and obstructions strongly influence flow patterns. Such information is useful in understanding instrumentation readings in PWR experiments or in associated reference loops.

32220 (WARD-MRP—153) **Shippingport Atomic Power Station (PWR). Technical progress report, July 26, 1979-January 25, 1980.** (Bettis Atomic Power Lab., West Mifflin, PA (USA)). 1980. Contract AC11-76PN00014. 38p. NTIS, PC A03/MF A01.

The Shippingport Atomic Power Station was operated with the Light Water Breeder Reactor core at high power levels (base load) throughout this report period except for reductions in power or brief shutdowns to perform planned testing. Evaluation of core test data taken during this period continues to show that the core is operating in accordance with design predictions. Periodic flow coefficient of reactivity measurements is reported which all meet the criteria on which the revised core protection setpoints and station operating procedures were based.

POWER REACTORS, NON-BREEDING, GRAPHITE MODERATED

REFER ALSO TO CITATION(S) 32261, 32262, 32267, 32335

32221 (COO—4057-4(Vol.1)) **Gas Reactor International Cooperative Program. Interim report: assessment of gas-cooled reactor economics.** (General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.). Aug 1979. Contract EN-77-C-02-4057. 112p. NTIS, PC A06/MF A01.

The merits of introducing Pebble Bed Gas Reactors (PBRs) into the existing US electric generating sector are discussed. Information is presented concerning an economic model; nuclear fuel costs; capital cost targets; time comparison of nuclear power costs; introduction scenarios; domestic economic incentives; the selection of a discount rate for national energy supply studies; nuclear fuel cycle cost calculation code RAMMER; and PBR and HTGR fabrication and reprocessing costs.

32222 Infinite blender for high temperature gas-cooled reactor fuel microspheres. Willey, M.G. US Patent Application 064,592. [nd]. 9p.

An infinite blender that achieves a homogeneous mixture of fuel microspheres is provided. Blending is accomplished by directing respective groups of desired particles onto the apex of a stationary coaxial cone. The particles progress downward over the cone surface and deposit in a space at the base of the cone that is described by a flexible band provided with a wide portion traversing and in continuous contact with the circumference of the cone base and extending upwardly therefrom. The band, being attached to the cone at a narrow inner end thereof, causes the cone to rotate on its arbor when the band is subsequently pulled onto a take-up spool. As a point at the end of the wide portion of the band passes the point where it is tangent to the cone, the blended particles are released into a delivery tube leading directly into a mold, and a plate mounted on the lower portion of the cone and positioned between the end of the wide portion of the band and the cone assures release of the particles only at the tangent point.

POWER REACTORS, BREEDING

REFER ALSO TO CITATION(S) 32220, 32260, 32282, 32283, 32311, 32316, 32317, 32318, 32320, 32323, 32332

32223 Liquid-metal-cooled reactor. Hutter, E. US Patent Application 077,821. [nd]. 9p.

A perforated depressor plate extending across the bottom of the instrument tree of a fast breeder reactor cooperates with a circular cylindrical metal bellows forming a part of the upper adapter of each core assembly and bearing on the bottom of the depressor plate to restrict flow of coolant between core assemblies, thereby reducing significantly the pressure differential between the coolant inside the core assemblies and the coolant outside of the core assemblies. Openings in the depressor plate are slightly smaller than the top of the upper adapter so the depressor plate will serve as a backup mechanical holddown for the core. In addition, coolant mixing devices and locating devices are provided attached to the depressor plate.

32224 Vibrating fuel grapple. Chertock, A.J.; Fox, J.N.; Weissinger, R.B. US Patent Application 034,229. [nd]. 11p.

A reactor refueling method is described which utilizes a vibrating fuel grapple for removing spent fuel assemblies from a reactor core. It incorporates a pneumatic vibrator in the grapple head which allows additional withdrawal capability without exceeding the allowable axial force limit. The only moving part in the vibrator is a steel ball, pneumatically driven by a gas, such as argon, around a track, with centrifugal force created by the ball being transmitted through the grapple to the assembly handling socket.

32225 (ANL—79-100) **Experiments on cold-trap regeneration by NaH decomposition.** McPheeters, C.C.; Skladzien, S.B.; Raue, D.J. (Argonne National Lab., IL (USA)). Jun 1980. Contract W-31-109-ENG-38. 20p. NTIS, PC A02/MF A01.

Cold-trap regeneration may be very important in future LMFBRs because of the expected high hydrogen source from the steam generators. This hydrogen precipitates as NaH in the cold trap and may fill the trap within one year of operation. Several methods of cold-trap regeneration were considered, but the simplest and least expensive appears to be decomposition of NaH under vacuum at elevated temperatures. Experiments were done to assess the feasibility of this method for cold-trap regeneration. Small-scale simulated cold traps (SCT) were loaded with NaH and NaH plus Na_2O, and were heated both under vacuum and under a sweep gas at 100 kPa. The evolved hydrogen was converted to water by a CuO bed and collected in a weighing tube.

32226 (CONF-791008—6) **Field radiography using 100 Ci of Co-60 without interrupting adjacent manufacturing operations.** Donnelly, C.W. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 1979. Contract AC04-76DP-3533. 13p. NTIS, PC A02/MF A01.

From ASNT fall conference; St Louis, MO, USA (15 Oct 1979).

Radiography is the primary method of Nondestructive Examination recognized by the ASME B and PV Code as providing objective evidence of volumetric examination of the pressure boundary welds that are present in the Clinch River Breeder Reactor Program (CRBRP) Steam Generator. In order to support the steam generator production schedule, the radiographic examinations must be performed without interrupting any other manufacturing or inspection operations taking place within a 20-ft radius from the source. This condition imposes rigorous radiation safety requirements since the gamma radiation sources chosen to be used for examination of the pressure boundary welds, Co-60 and Ir-192, are very energetic. Co-60 gamma ray energy is 1.17 and 1.33 MeV and Ir-192 gamma ray is .6 MeV. The hazard of using such a high energy sources in the immediate vicinity of working personnel has necessitated the need for a thorough evaluation of methods of protection. Personnel protection from penetrating radiation, both x-ray and gamma ray, is accomplished by ingenious use, singly or in combination, of two factors which reduce radiation intensity. These factors are distance and shielding. In all radiographic operations the primary consideration is for personnel safety. The maximum radiation dose rate limit will be 0.002 rem/hr. This document describes how the factors of distance and shielding have been used to assure personnel safety at all times.

32227 (CONF-800804—2) **Evaluation of clamp effects on LMFBR piping systems.** Jones, G.L. (Swanson Engineering Associates Corp., McMurray, PA (USA)). 1980. Contract AC15-76CL02395. 30p. NTIS, PC A03/MF A01.

From ASME century 2 emerging technology conference; San Francisco, CA, USA (10 Aug 1980).

Loop-type liquid metal breeder reactor plants utilize thin-wall piping to mitigate through-wall thermal gradients due to rapid thermal transients. These piping loops require a support system to carry the combined weight of the pipe, coolant and insulation and to provide attachments for seismic restraints. The support system examined here utilizes an insulated pipe clamp designed to minimize the stresses induced in the piping. To determine the effect of these clamps on the pipe wall a non-linear, two-dimensional, finite element model of the clamp, insulation and pipe wall was used to determine the clamp/pipe interface load distributions which were then applied to a three-dimensional, finite element model of the pipe. The two-dimensional interaction model was also utilized to estimate the combined clamp/pipe stiffness.

32228 (CONF-800804—8) **Design of a hot clamp for small diameter LMFBR piping.** Jones, J.W.; Hamel, D. (Swanson Service Corp., Huntingdon Beach, CA (USA)). 1980. Contract AC15-76CL02395. 28p. NTIS, PC A03/MF A01.

From ASME century 2 emerging technology conference; San Francisco, CA, USA (10 Aug 1980).

In order to evaluate the feasibility of using a strap-type clamp on breeder reactor small diameter piping, a series of analyses were conducted to determine the thermal and mechanical stresses induced in the pipe by the clamp. The effect of using a thin layer of insulation of varying thickness between the pipe and clamp was also investigated. A thermal analysis of the pipe and clamp was conducted for each thermal transient rate. Various insulation values ranging from metal-to-metal condition to perfect insulation between the pipe and clamp were analyzed to determine the effect of insulating the pipe from the clamp. An axisymmetric finite element model was used to determine the axial thermal and stress patterns.

32229 (CONF-800927—1) **Quality assurance in technology development for The Clinch River Breeder Reactor Plant Project.** Anderson, J.W. (Clinch River Breeder Reactor Plant Project Office, Oak Ridge, TN (USA)). 1980. Contract AC15-76CL11200. 13p. NTIS, PC A02/MF A01.

From 7. annual national energy division conference; Houston, TX, USA (29 Sep 1980).

The Clinch River Breeder Reactor Plant Project is the nation's first large-scale demonstration of the Liquid Metal Fast Breeder Reactor (LMFBR) concept. The Project has established an overall program of plans and actions to assure that the plant will perform as required. The program has been established and is being implemented in accordance with Department of Energy Standard RDT F 2-2. It is being applied to all parts of the plant, including the development of technology supporting its design and licensing activity. A discussion of the program as it is applied to development is presented.

32230 (DOE/CEA/BMFT—14) **Bellows for the DEBENE SNR-project.** Warmerdam, C.P.; Lievense, K. (Nijverheidsorganisatie TNO, Apeldoorn (Netherlands); Neratoom N.V., The Hague (Netherlands)). 24 Oct 1979. 21p. (CONF-791168—1). NTIS (US Sales Only), PC A02/MF A01.

From IAEA specialists' meeting on bellows for sodium systems; Tokyo, Japan (5 Nov 1979).

Work performed under United States-CEA/BMFT Fast Reactor Exchange Program.

In co-operation between Neratoom and TNO a feasibility study concerning the applicability of bellows as compensating elements in a primary piping system of a loop type LMFBR has been studied. Different configurations are compared with each other. TNO has performed dimension calculations, with the criteria from the ASME Code Section III and Code Case N-47, as guideline. A review of the results of these calculations is given. The development of the expansion bellows in the shells of the SNR 300 straight tube steam generators, to compensate the difference in the thermal expansion between shell and tube bundle, has been concluded by a series of full scale fatigue tests under design conditions, except for the sodium environment. A summary is given of these tests and of the procedure used to prove that the bellows of the actual steam generators will withstand the design fatigue loads.

32231 (DOE/CEA/BMFT—17) **Expansion joints for LMFBR.** Dzenus, M.; Hundhausen, W.; Jansing, W. (Internationale Atomreaktorbau G.m.b.H. (INTERATOM), Bergisch Gladbach (Germany, F.R.)). Oct 1979. 34p. (CONF-791168—2). NTIS (US Sales Only), PC A03/MF A01.

From IAEA specialists' meeting on bellows for sodium systems; Tokyo, Japan (5 Nov 1979).

Work performed under United States-CEA/BMFT Fast Reactor Exchange Program.

This discourse recounts efforts put into the SNR-2 project; specifically the development of compensation devices. The various prototypes of these compensation devices are described and the state of development reviewed. The expansion joints were developed on the basis of specific design criteria whereby differentiation is made between expansion joints of small and large nominal diameter. Expansion joints for installation in the sodium-filled primary piping are equipped with safety bellows in addition to the actual working bellows.

32232 (DOE/ET/37241—42) **MIT LMFBR Blanket Research Project. Quarterly progress report, January 1-March 31, 1980.** Driscoll, M.J. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering). 31 May 1980. Contract AS02-76ET37241. 16p. NTIS, PC A02/MF A01.

During FY 1980 work is being carried out on the following subtasks: evaluation of the thermal/hydraulic/mechanical consequences of enhanced fertile and fissile capture rates at interfaces; development of simpler ways to estimate interface capture rate enhancement; particularization of the breed/burn internal/external blanket management scheme; and participation in the Large Core Code Evaluation Working Group (LCCEWG) program.

32233 (GA-A—15602) **Analysis of experiments in the Phase III GCFR benchmark critical assembly.** Hess, A.L.; Baylor, K.J. (General Atomic Co., San Diego, CA (USA)). Apr 1980. Contract AT03-76SF71023. 126p. NTIS, PC A07/MF A01.

Experiments carried out in the third gas-cooled fast breeder reactor (GCFR) benchmark critical assembly on the Zero Power Reactor-9 at Argonne National Laboratory were analyzed using methods and computer codes employed routinely for design and performance evaluations on power-plant GCFR cores. The program for the Phase III GCFR assembly, with a 1900-liter, three-enrichment zone core, included measurements of reaction-rate profiles in a typical power-flattened design, studies of material reactivity coefficients, reaction ratio and breeding parameter determinations, and comparison of pin with plate fuel loadings. Calculated parameters to compare with all of the measured results were obtained using 10-group cross sections based on ENDF/B-4 and two-dimensional diffusion theory, with adjustments for fuel-cell heterogeneity and void-lattice streaming effects.

32234 (GA-A—15851) **Integration of reliability objectives into GCFR Accident Prevention Program.** Torri, A.; Katz, R. (General Atomic Co., San Diego, CA (USA)). May 1980. Contract AT03-76SF71023. 21p. (CONF-800648—4). NTIS, PC A02/MF A01.

From GCFRP program technical review meeting; San Diego, CA, USA (4 Jun 1980).

Under DOE sponsorship, the Gas-Cooled Fast Breeder Reactor (GCFR) Program is implementing a program to integrate reliability into the engineering and design of safety-related systems, subsystems, and components. The objective of the program is to ensure that reliability goals established for each Line of Protection (LOP) are met consistent with the overall plant goals. Special consideration is given to components for which only a generic data base exists. Based on evaluations of past reliability test programs, it is concluded that full-scale reliability test programs are not cost effective but that extended design verification and support (DV and S) testing may be warranted in special circumstances. The paper discusses the major elements of the program, their relationship, and benefits to the design of safety systems.

32235 (GA-A—15906) **GCFR residual heat removal capability.** Chi, H.W.; Chung, H.S.; Shenoy, A. (General Atomic Co., San Diego, CA (USA)). May 1980. Contract AT03-76SF71023. 31p. (CONF-800648—6). NTIS, PC A03/MF A01.

From GCFRP program technical review meeting; San Diego, CA, USA (4 Jun 1980).

The residual heat removal (RHR) capability for providing lines of protection (LOPS) 1 and 2 of the gas-cooled fast breeder reactor (GCFR) demonstration plant is described. Included are design criteria and system descriptions for the RHR cooling systems and the portion of the plant protection system that is related to initiation of the RHR system operation. The design features of these systems provide inherently redundant and diverse means of core cooling for the GCFR. The hierarchy in the selection of the RHR systems and the application of the systems to key transient events are discussed. Methods of RHR system operation, dynamic responses of the GCFR plant, and margins of safety in RHR operations are also presented.

32236 (GA-A—15918) **Refueling system for the gas-cooled fast breeder reactor.** Hawke, B.C. (General Atomic Co., San Diego, CA (USA)). May 1980. Contract AT03-76SF71023. 31p. (CONF-800648—5). NTIS, PC A03/MF A01.

From GCFRP program technical review meeting; San Diego, CA, USA (4 Jun 1980).

Criteria specifically related to the handling of Gas-Cooled Fast Breeder Reactor (GCFR) fuel are briefly reviewed, and the most significant requirements with which the refueling system must comply are discussed. Each component of the refueling system is identified, and a functional description of the fuel handling machine is presented. An illustrated operating sequence describing the var-

ious functions involved in a typical refueling cycle is presented. The design status of components and subsystems selected for conceptual development is reviewed, and anticipated refueling time frames are given.

32237 (GA-A—15922) **GCFR shielding design and supporting experimental programs.** Perkins, R.G.; Hamilton, C.J.; Bartine, D. (General Atomic Co., San Diego, CA (USA); Oak Ridge National Lab., TN (USA)). May 1980. Contract AT03-76SF71023. 34p. (CONF-800648—2). NTIS, PC A03/MF A01.

From GCFRP program technical review meeting; San Diego, CA, USA (4 Jun 1980).

The shielding for the conceptual design of the gas-cooled fast breeder reactor (GCFR) is described, and the component exposure design criteria which determine the shield design are presented. The experimental programs for validating the GCFR shielding design methods and data (which have been in existence since 1976) are also discussed.

32238 (HEDL-SA—1870) **Radioactive material transport in sodium-cooled nuclear reactors.** Brehm, W.F.; McGuire, J.C.; Colburn, R.P.; Maffei, H.P.; Olson, W.H. (Hanford Engineering Development Lab., Richland, WA (USA); Argonne National Lab., IL (USA)). Mar 1980. Contract AC14-76FF02170. 11p. (CONF-800401—20). NTIS, PC A02/MF A01.

From 2. international conference of liquid metal technology for energy systems; Richland, WA, USA (20 Apr 1980).

Trapping devices which remove nuclides from the sodium stream in pre-selected locations away from maintenance areas have been developed and proven successful in in-reactor testing. The release of corrosion product radionuclides as a function of system temperature and oxygen content has been quantitatively evaluated. Ongoing work concentrates on further in-reactor testing of radionuclide removal devices, and characterization of fission product release and deposition from fuel pins with breached-cladding.

32239 (HEDL-SA—1871-FP) **Cesium behavior and control in sodium systems.** Colburn, R.P.; Maffei, H.P. (Hanford Engineering Development Lab., Richland, WA (USA)). Mar 1980. Contract AC14-76FF02170. 16p. (CONF-800401—19). NTIS, PC A02/MF A01.

From 2. international conference of liquid metal technology for energy systems; Richland, WA, USA (20 Apr 1980).

A series of capsule tests were performed to screen candidate packing materials for a Cs trap. Specimens of medium density graphite rho = 1.8 to 1.7 gm/cm^3 and a low density amorphous carbon foam, Reticulated Vitreous Carbon (RVC) rho = 0.06 gm/cm^3 were tested. X-ray diffraction verified the hexagonal structure of the graphite specimens and the amorphous structure of the RVC. The test capsules contained approximately 0.1 mCi (3.7 x 10^3 Kbq)^{137}Cs dissolved in 30 gm of sodium. The behavior of Cs in a circulating sodium system was studied in the Fission Product Transport Loop (FPTL). Tracer isotopes, 1 mCi (3.7 x 10^{4}KBq)^{137}Cs, 1 mCi (3.7 x 10^{4}KBq)^{134}Cs and 0.5 mCi^{22}(1.85 x 10^{4}KBq)^{22}Na were added to the 19 kg sodium inventory in the loop. The tracer distributions in the loop were monitored with a collimated GeLi detector and multichannel analyzer.

32240 (HEDL-SA—1875-FP) **Hydrogen permeation resistant layers for liquid metal reactors.** McGuire, J.C. (Hanford Engineering Development Lab., Richland, WA (USA)). Mar 1980. Contract AC14-76FF02170. 14p. (CONF-800427—17). NTIS, PC A02/MF A01.

From Tritium technology in fission, fusion, and isotopic applications; Dayton, OH, USA (29 Apr 1980).

Reviewing the literature in the tritium diffusion field one can readily see a wide divergence in results for both the response of permeation rate to pressure, and the effect of oxide layers on total permeation rates. The basic mechanism of protective oxide layers is discussed. Two coatings which are less hydrogen permeable than the best naturally occurring oxide are described. The work described is part of an HEDL-ANL cooperative research program on Tritium Permeation in Liquid Metal Cooled Reactors. This includes permeation work on hydrogen, deuterium, and tritium with the hydrogen-deuterium research leading to the developments presented.

32241 (HEDL-SA—1886-FP) **HEDL sodium vapor deposit experience.** Funk, C.W. (Hanford Engineering Development Lab., Richland, WA (USA)). Dec 1979. Contract AC14-76FF02170. 8p. (CONF-800401—26). NTIS, PC A02/MF A01.

From 2. international conference of liquid metal technology for energy systems; Richland, WA, USA (20 Apr 1980).

Sodium vapor deposits can affect reactor component operation and maintenance. Recorded cases include plugged cover gas lines and cementation of rotating components or sliding surfaces. Deposits found on plant scale components after testing in sodium were measured. Laboratory tests show the effect of Na pool temperature and condenser geometry on deposit accumulation rates and viewport fogging.

32242 (HEDL-SA—1897-FP) **Silicon mass transfer in sodium loops and the resulting/thermal hydraulic effects.** Yunker, W.H. (Hanford Engineering Development Lab., Richland, WA (USA)). Feb 1980. Contract AC14-76FF02170. 23p. (CONF-800401—17). NTIS, PC A02/MF A01.

From 2. international conference of liquid metal technology for energy systems; Richland, WA, USA (20 Apr 1980).

The element silicon in the surface of new, 300 series stainless steel has been shown to rapidly dissolve in sodium above 525°C. It deposits in slightly cooler regions as a crystalline compound with sodium and oxygen. In tests, the deposits have caused increases in hydraulic friction factor (hence, increased pressure loss) of up to 300% at Reynolds Numbers of 14^4 to 10^5.Also, they have contributed to local losses of heat transfer rate to 1/10 the original value, at a Reynolds Number of approximately 10^4. The crystals quickly decompose when out of sodium. Measurements made with a sodium loop (volume = 0.42 m^3) include compound solubility vs temperature, loop conditions vs source rates and deposit transfer rates. Laboratory examinations and analyses of the crystals have also been made. The effects of this material have been observed also in a number of other loops. With the data from these studies, such effects are now explained and can be controlled or eliminated by system design and operation.

32243 (HEDL-SA—1941) **Qualification of tribological materials and coatings for use in sodium.** Johnson, R.N.; Farwick, D.G. (Hanford Engineering Development Lab., Richland, WA (USA)). 21 Apr 1980. Contract AC14-76FF02170. 12p. (CONF-800667—1). NTIS, PC A02/MF A01.

From 2. international conference on liquid metal technology in energy production; Richland, WA, USA (21 Jun 1980).

This paper describes some of the essential performance measures used to qualify materials for tribological applications in liquid sodium environments and summarizes relative properties of some of the newer tribological materials now qualified for use in sodium systems.

32244 (HEDL-SA—1954) **Deposition and removal of radioactive isotopes from LMFBR components.** Hill, E.F.; Lutton, J.M.; Maffei, H.P. (Hanford Engineering Development Lab., Richland, WA (USA)). 1980. Contract AC14-76FF02170. 22p. (CONF-800401—21). NTIS, PC A02/MF A01.

From 2. international conference of liquid metal technology for energy systems; Richland, WA, USA (20 Apr 1980).

The development of an analytical model to describe the production, transport and eventual removal of radioactive materials in the primary sodium of LMFBR's is a continuing Sodium Technology activity sponsored by the Department of Energy. This paper describes studies directed toward obtaining an understanding of the deposition from sodium of fuel cladding activated corrosion products onto stainless steel alloys and the effect of their diffusion into the base metal on the process required to decontaminate it. The objective of the decontamination operation is to reduce the activity to a level allowing hands on maintenance without causing unacceptable damage to the component.

32245 (HEDL-SA—1988) **Control of radioactive material transport in sodium-cooled reactors.** Brehm, W.F. (Hanford Engineering Development Lab., Richland, WA (USA)). Mar 1980. Contract AC14-76FF02170. 17p. (CONF-800334—15). NTIS, PC A02/MF A01.

From 2. DOE environmental control symposium; Reston, VA, USA (17 Mar 1980).

The Radioactivity Control Technology (RCT) program was established by the Department of Energy to develop and demonstrate methods to control radionuclide transport to ex-core regions of sodium-cooled reactors. This radioactive material is contained within the reactor heat transport system with any release to the environment well below limits established by regulations. However, maintenance, repair, decontamination, and disposal operations potentially expose plant workers to radiation fields arising from radionuclides transported to primary system components. This paper deals with radioactive material generated and transported during steady-state operation, which remains after ^{24}Na decay. Potential release of radioactivity during postulated accident conditions is not discussed. The control methods for radionuclide transport, with emphasis on new information obtained since the last Environmental Control Symposium, are described. Development of control methods is an achievable goal.

32246 (HEDL-SA—2049-FP) **Automated fabrication of reactor fuel.** Nyman, D.H.; McLemore, D.R.; Bennett, D.W.; Yatabe, J.M. (Hanford Engineering Development Lab., Richland, WA (USA)). 16 Apr 1980. Contract AC14-76FF02170. 16p. (CONF-800607—81). NTIS, PC A02/MF 01.

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

The development of Secure Automated Fabrication (SAF) methods is the goal of the United States breeder reactor program

and will form the technological basis for the future breeder reactor fuel supply. A major factor in achieving this goal is the development of remotely operated fuel fabrication equipment. The unit operations are being designed for microprocessor control connected to a central control center. The program schedule is to demonstrate the feasibility of automated pellet fuel fabrication and remote maintenance techniques by the mid-1980's. Development of major ceramic unit operations and the required computer control system is currently in the engineering testing stage.

32247 (HEDL-SA—2050-FP) **Cladding dimensional changes in mixed oxide fuel pins.** Makenas, B.J.; Jost, J.W.; Hales, J.W. (Hanford Engineering Development Lab., Richland, WA (USA)). 1980. Contract AC14-76FF02170. 20p. (CONF-800607—70). NTIS, PC A02/MF A01.

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

Several types of stainless steel (304, 316, 316-20% Cold Worked, and 316 Titanium stabilized 20% CW) have been used as cladding for mixed oxide (U, Pu)O_2 fuel pins irradiated in EBR-II. All of the materials have performed satisfactorily in their respective experimental subassemblies but significant differences in swelling and inelastic strain behavior have been found at high fast fluences among the different materials and among different heats of the same material. Cladding diameter increases were measured for 622 developmental and FFTF reference design fuel pins which were irradiated in 19 experimental subassemblies. Fuel pin diameters were determined from multiangle axial trace profilometry measurements.

32248 (HEDL-SA—2126-S-FP) **Overview of the fast reactors fuels program.** Evans, E.A.; Cox, C.M.; Hayward, B.R.; Rice, L.H.; Yoshikawa, H.H. (Hanford Engineering Development Lab., Richland, WA (USA)). Apr 1980. Contract AC14-76FF02170. 13p. (CONF-800607—69). NTIS, PC A02/MF A01.

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

Each nation involved in LMFBR development has its unique energy strategies which consider energy growth projections, uranium resources, capital costs, and plant operational requirements. Common to all of these strategies is a history of fast reactor experience which dates back to the days of the Manhatten Project and includes the CLEMENTINE Reactor, which generated a few watts, LAMPRE, EBR-I, EBR-II, FERMI, SEFOR, FFTF, BR-1, -2, -5, -10, BOR-60, BN-350, BN-600, JOYO, RAPSODIE, Phenix, KNK-II, DFR, and PFR. Fast reactors under design or construction include PEC, CRBR, SuperPhenix, SNR-300, MONJU, and Madras (India). The parallel fuels and materials evolution has fully supported this reactor development. It has involved cermets, molten plutonium alloy, plutonium oxide, uranium metal or alloy, uranium oxide, and mixed uranium-plutonium oxides and carbides.

32249 (HEDL-TC—1213) **FFTF irradiation of fracture mechanics specimens for out-of-core structures.** King, D.C. (Hanford Engineering Development Lab., Richland, WA (USA)). Sep 1978. Contract AC14-76FF02170. 63p. NTIS, PC A04/MF A01.

The National Program Plan has established data requirements for out-of-core structures for FBRs. Significant FFTF irradiation space with moderate gamma heating levels is required to irradiate relatively large fracture mechanics specimens to total neutron fluences ranging between 5 x 10^{21} and 5 x 10^{22} n/cm^3 and temperatures which range between 400°C (750°F) and 650°C (1200°F). Priority 1 data on stainless steel welds requires a test volume of 7443 cm^3 (454 in^3). Priority 2 data on 304 and 316 SS and Inconel 718 materials and Inconel 718 welds requires 2760 cm^3 (168 in^3). Priority 3 data on stainless steels, other nickel-base alloys, and ferritics requires 33,118 cm^3 (2021 in^3). Priority 4 data at elevated temperatures on stainless steels, other nickel-base alloys and ferritics requires 69,182 cm^3 (4221 in^3).

32250 (LA—8304-MS) **Preparation of carbide-type, advanced LMFBR fuel pellets for irradiation testing.** Gutierrez, R.L.; Herbst, R.J. (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 11p. NTIS, PC A02/MF A01.

A carbothermic reduction process was established to fabricate single- and two-phase uranium-plutonium carbide fuel on a production basis. Sintering temperatures of 1550 and 1800°C were used to prepare fuel densities of 98, 87, and 81% of theoretical.

32251 (LA—8415-MS) **Critical CRBR core pressure.** Ju, F.D. (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 28p. NTIS, PC A03/MF A01.

The conditions are detailed under which gas pressure will cause or initiate failure in the structural containment of the fuel core. The Clinch River Breeder Reactor Plant is the prototype structure. Two general classes of problems have been studied, representing two entirely distinct configurations of containment failure. The first model determines the minimum pressure to lift a portion or the entire core from its containment. The second model estimates the critical pressure above which the fuel rods interior to the hexagonal fuel can warp, leading to blockage of the gas passages. Such blockage might cause further buildup of the gas pressure to a level causing the failure of the fuel rod containment in the hexagonal fuel container.

32252 (LA—8451-MS) **Global stiffness of hex-can assembly in a uniform force field.** Ju, F.D.; Bennett, J. (Los Alamos Scientific Lab., NM (USA)). Jul 1980. Contract W-7405-ENG-36. 37p. NTIS, PC A03/MF A01.

Two approximate constitutive equations are derived that can be used to represent the global stiffness of a hexagonal cross-section duct in a uniform force field. The first equation uses a single coefficient that can be determined from Poisson's ratio for the material and the duct geometry. This equation is useful for isothermal applications. The second equation can be used to account for temperature-varying material properties and requires that two coefficients be determined from Poisson's ratio and the duct geometry. These equations are useful both in reactor safety analysis and design.

32253 (ORNL/TM—7221) **Processing ENDF/B-V uncertainty data into multigroup covariance matrices.** Smith, J.D. III. (Oak Ridge National Lab., TN (USA)). Jun 1980. Contract W-7405-ENG-26. 65p. (ENDF—295). NTIS, PC A04/MF A01.

The purpose of this work is to develop and demonstrate the capability of processing Evaluated Nuclear Data File, system B, version five (ENDF/B-V) uncertainty data into multigroup covariance matrices. These covariances may then be folded with sensitivity coefficients to obtain uncertainties in selected integral parameters such as K-effective and breeding ratio. The project consisted of separating the previous uncertainty processor (PUFF) from the basic nuclear data cross section processor (MINX), updating the uncertanty processor to theENDF/B-V format, programming the processor for new uncertainty data, and demonstrating the processor capabilities by producing a multigroup covariance library. These capabilities were verified in various ways including hand calculations and comparisons with other known results. A computer code named PUFF-II was written to perform the task described above.

32254 (WAPD-TM—1384) **Finite deformation analysis of continuum structures with time dependent anisotropic elastic plastic material behavior (LWBR/AWBA Development Program).** Hutula, D.N. (Bettis Atomic Power Lab., West Mifflin, PA (USA)). Mar 1980. Contract AC11-76PN00014. 27p. NTIS, PC A03/MF A01.

A finite element procedure is presented for finite deformation analysis of continuum structures with time-dependent anisotropic elastic-plastic material behavior. An updated Lagrangian formulation is used to describe the kinematics of deformation. Anisotropic constitutive relations are referred, at each material point, to a set of three mutually orthogonal axes which rotate as a unit with an angular velocity equal to the spin at the point. The time-history of the solution is generated by using a linear incremental procedure with residual force correction, along with an automatic time step control algorithm which chooses time step sizes to control the accuracy and numerical stability of the solution.

32255 (WAPD-TM—1462) **Critical heat flux experiments in a circular tube with heavy water and light water. (AWBA Development Program).** Williams, C.L.; Beus, S.G. (Bettis Atomic Power Lab., West Mifflin, PA (USA)). May 1980. Contract AC11-76PN00014. 69p. NTIS, PC A04/MF A01.

Experiments were performed to establish the critical heat flux (CHF) characteristics of heavy water and light water. Testing was performed with the up-flow of heavy and of light water within a 0.3744 inch inside diameter circular tube with 72.3 inches of heated length. Comparisons were made between heavy water and light water critical heat flux levels for the same local equilibrium quality at CHF, operating pressure, and nominal mass velocity. Results showed that heavy water CHF values were, on the average, 8 percent below the light water CHF values.

32256 **Vertical pump with free floating check valve.** Lindsay, M. (to Dept. of Energy). US Patent 4,188,173. 12 Feb 1980. Filed date 6 Oct 1976. 6p.

PAT-APPL-730,056.

A vertical pump is described which has a bottom discharge with a free floating check valve disposed in the outlet plenum thereof. The free floating check valve comprises a spherical member with a hemispherical cage-like member attached thereto which is capable of allowing forward or reverse flow under appropriate conditions while preventing reverse flow under inappropriate conditions.

32257 **Closure head for a nuclear reactor.** Wade, E.E. (to Dept. of Energy). US Patent 4,181,572. 1 Jan 1980. Filed date 16 Jun 1977. 8p.

PAT-APPL-806,972.

A closure head for a nuclear reactor includes a stationary outer ring integral with the reactor vessel with a first rotatable plug disposed within the stationary outer ring and supported from the

stationary outer ring by a bearing assembly. A sealing system is associated with the bearing assembly to seal the annulus defined between the first rotatable plug and the stationary outer ring. The sealing system comprises tubular seal elements disposed in the annulus with load springs contacting the tubular seal elements so as to force the tubular seal elements against the annulus in a manner to seal the annulus. The sealing system also comprises a sealing fluid which is pumped through the annulus and over the tubular seal elements causing the load springs to compress thereby reducing the friction between the tubular seal elements and the rotatable components while maintaining a gas-tight seal therebetween.

32258 **Method and apparatus for thermal power generation.** Mangus, J.D. (to Dept. of Energy). US Patent 4,164,849. 21 Aug 1979. Filed date 30 Sep 1976. 8p.
PAT-APPL-728,478.

A method is described for power generation from a recirculating superheat-reheat circuit with multiple expansion stages which alleviates complex control systems and minimizes thermal cycling of system components, particularly the reheater. The invention includes preheating cold reheat fluid from the first expansion stage prior to its entering the reheater with fluid from the evaporator or drum component.

32259 (DOE/TIC—11233) **Inservice inspection system development program.** (Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs). [nd]. 4p. NTIS, PC A02/MF A01.

The ISI system is being designed to inspect long helical tubing having thick ferromagnetic walls. The purpose of periodic ISI inspections is to detect defects or wall thinning which may produce a tubing failure during the subsequent operation of the generator. Additionally, the system could provide information on the size, orientation, and location of defects (see objective for performance goals) so that the severity can be evaluated. UT Inspection has been selected as the most promising technique for the B and W steam generator design. Ultrasonic techniques are being pursued in this feasibility study since present eddy current (EC) techniques do not seem practical for thick walled, ferromagnetic, helical tubing.

POWER REACTORS, AUXILIARY, MOBILE, PACKAGE, AND TRANSPORTABLE

REFER ALSO TO CITATION(S) 32267

ECONOMICS

CONSTRUCTION AND OPERATION

REFER ALSO TO CITATION(S) 32385

FUEL CYCLE

REFER ALSO TO CITATION(S) 31672, 31708

32260 (LA—8291-MS) **Comparative assessment of nuclear fuel cycles. Light-water reactor once-through, classical fast breeder reactor, and symbiotic fast breeder reactor cycles.** Hardie, R.W.; Barrett, R.J.; Freiwald, J.G. (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 76p. NTIS, PC A05/MF A01.

The object of the Alternative Nuclear Fuel Cycle Study is to perform comparative assessments of nuclear power systems. There are two important features of this study. First, this evaluation attempts to encompass the complete, integrated fuel cycle from mining of uranium ore to disposal of waste rather than isolated components. Second, it compares several aspects of each cycle - energy use, economics, technological status, proliferation, public safety, and commercial potential - instead of concentrating on one or two assessment areas. This report presents assessment results for three fuel cycles. These are the light-water reactor once-through cycle, the fast breeder reactor on the classical plutonium cycle, and the fast breeder reactor on a symbiotic cycle using plutonium and ^{233}U as fissile fuels. The report also contains a description of the methodology used in this assessment. Subsequent reports will present results for additional fuel cycles.

PROCESS HEAT REACTORS

32261 (COO—4057-11) **Gas reactor international cooperative program: HTR market assessments.** Leeth, G.G.; Berkowitz, B.J. (General Electric Co., Santa Barbara, CA (USA). Center for Advanced Studies). Sep 1979. Contract EN-77-C-02-4057. 38p. NTIS, PC A03/MF A01.

The HTR Multiplex utilizes the HTR as an energy source to produce multiple forms of energy. The multiplex technolog is applicable to the following markets: dispersed industrial heat; peaking and mid-range electricity; ammonia and methanol production with methane feedstock; and production of gaseous and liquid fuels from coal. It is estimated that the first two markets will comprise from 300 GW(+) to 400 GW(+) in the 2000 to 2020 time period (about 8 quads per year). For the dispersed industrial heat, the HTR multiplex has a heat cost about half that of fluidized bed combustors (FBC) operating at a capacity factor of 0.3 and about equal to that of FBC's operating at a capacity factor of 0.9. For the peaking and mid-range electric market, the HTR multiplex can supply electric energy at costs three-fourths that of FBC's operating at a capacity of 0.1 and equal to that of FBC's operating at a capacity factor of 0.3. For the ammonia and methanol markets, the HTR multiplex costs are about equal to coal and somewhat higher than methane with current fuel prices. Application to coal refining is similar to the ammonia and methanol markets. Current economic analyses show approximate equivalence for coal and nuclear heat.

32262 (GA-A—15837) **HTGR-GT closed-cycle gas turbine: a plant concept with inherent cogeneration (power plus heat production) capability.** McDonald, C.F. (General Atomic Co., San Diego, CA (USA)). Apr 1980. Contract AT03-76SF70046. 10p. (CONF-800806—14). NTIS, PC A02/MF A01.

From 15. intersociety energy conversion engineering conference; Seattle, WA, USA (18 Aug 1980).

The high-grade sensible heat rejection characteristic of the high-temperature gas-cooled reactor-gas turbine (HTGR-GT) plant is ideally suited to cogeneration. Cogeneration in this nuclear closed-cycle plant could include (1) bottoming Rankine cycle, (2) hot water or process steam production, (3) desalination, and (4) urban and industrial district heating. This paper discusses the HTGR-GT plant thermodynamic cycles, design features, and potential applications for the cogeneration operation modes. This paper concludes that the HTGR-GT plant, which can potentially approach a 50% overall efficiency in a combined cycle mode, can significantly aid national energy goals, particularly resource conservation.

NUCLEAR REACTOR TECHNOLOGY

REFER ALSO TO CITATION(S) 32212

THEORY AND CALCULATION

REFER ALSO TO CITATION(S) 32253, 32946

32263 (AD-A—075968) **Nuclear studies of a uranium metal-metal excimer nuclear laser/reactor with nuclear light bulb design. Technical report.** Womack, D.R.; McDaniel, B.; Miller, T.G. (Army Missile Research and Development Command, Redstone Arsenal, AL (USA). High Energy Laser and Research Lab.). 17 Jul 1978. 88p. NTIS, PC A05/MF A01.

Uranium metal may have the potential of forming a metal excimer with zinc, cadmium or mercury. Excimers are the most efficient electronic transition lasers known, and metal excimers have spectra in the visible wavelength regions. Metal excimers of interest are InZn (5308, 5626 A), InCd (5544, 5760 A), InHg (5226 A), TlZn (4680, 6200 A), TlCd (4872, 6400 A), and TlHg (4590, 6560 A). A laser is proposed where uranium is both the pumping source, via fission fragments, and the lasant, via excimer formation (UZn, UCd, UHg) with output in the visible wavelengths. The metal excimers mentioned have not yet been made to lase. In this initial study, reactor physics calculations with the computer code ANISN, a multi-geometry, one-dimensional Boltzmann neutron transport code, were made to examine different reactor configurations. The uranium is required to be in a vapor state, and therefore reactor design is based heavily on the Nuclear Light Bulb Engine. Dependent upon the density requirements (of uranium and mercury, for example) for transmitting laser light, the reactor options include lasers that are self-critical to lasers that require criticality drivers.

32264 (CONF-800607—40) **Development and verification of multicycle depletion perturbation theory.** White, J.R.; Burns, T.J. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 6p. NTIS, PC A02/MF A01.

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

Recently, Williams has developed a coupled neutron/nuclide depletion perturbation theory (DPT) applicable to multidimensional and multigroup reactor analysis problems. This theoretical framework has been verified using the newly developed DEPTH module within the context of the VENTURE modular code system. The accuracy and usefulness of this alternate calculational method for burnup analyses has been demonstrated for a variety of final-time

response functionals. However, these examples were restricted to single-cycle depletion analyses due to the theoretical assumption that the nuclide density field was continuous in time. Clearly, in multicycle problems, the nuclide concentrations must vary discontinuously with time to model refueling and shuffling operations or discrete control rod movements. Thus, the purpose of this work is to generalize the original DPT framework to include nuclide discontinuities and to verify that this generalization can be employed in realistic multicycle applications.

32265 (CONF-800607—59) **Constrained sensitivity theory.** Greenspan, E.; Williams, M.L. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01.

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

In sensitivity and uncertainty analysis of to-be-built reactors it is customary to use k-reset sensitivity functions - accounting for the combined effects of the change (or uncertainty) in the input data and of the alteration in some design variable applied to maintain criticality. Critical reactors are usually subjected to several constraints, such as power peaking factor and breeding ratio constraints, in addition to the criticality constraint. Perturbation theory formulations which can account, simultaneously, for several constraints both in critical reactors and in source driven systems (such as radiation shields and blankets of fusion devices) are presented. All the sensitivity and uncertainty analyses of source driven systems carried out so far used unconstrained sensitivity functions despite the fact that such systems can be also subjected to a variety of constraints.

32266 (LA—8380-PR) **Transport and reactor theory. Progress report January 1-March 31, 1980.** Dudziak, D.J.; O'Dell, R.D.; Alcouffe, R.E. (Los Alamos Scientific Lab., NM (USA)). May 1980. Contract W-7405-ENG-36. 64p. NTIS, PC A03/MF A01.

Research and development progress in transport and reactor theory by the Los Alamos Scientific Laboratory's Group T-1 for the second quarter of FY 80 is reported. Included are tasks in the areas of fusion reactor nucleonics, shielding methods, transport methods supporting research, reactor safety analysis, and fission reactor neutronics.

32267 (LA—8403-PR) **Reactor technology. Progress report, January-March 1980.** Breslow, M.; Sullivan, S. (eds.). (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 88p. NTIS, PC A05/MF A01.

Progress is reported concerning space reactor (SPAR) electric power supply; GCFR reactor safety experiments; structural analysis of HTGR, PWR, and BWR containment vessels and pressure vessels; heat pipe technology development; and nuclear criticality experiments and safety.

COMPONENTS AND ACCESSORIES

32268 **Rapid scanning system for fuel drawers.** Caldwell, J.T.; Fehlau, P.E.; France, S.W. US Patent Application 090,845. [nd]. 13p.

A nondestructive method for uniquely distinguishing among and quantifying the mass of individual fuel plates in situ in fuel drawers utilized in nuclear reactors is described. The method is both rapid and passive, eliminating the personnel hazard of the commonly used irradiation techniques which require that the analysis be performed in proximity to an intense neutron source such as a reactor. In the present technique, only normally decaying nuclei are observed. This allows the analysis to be performed anywhere. This feature, combined with rapid scanning of a given fuel drawer (in approximately 30 s), and the computer data analysis allows the processing of large numbers of fuel drawers efficiently in the event of a loss alert.

32269 (CONF-800607—42) **Automated pattern recognition system for noise analysis.** Sides, W.H. Jr.; Piety, K.R. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 5p. NTIS, PC A02/MF A01.

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

A pattern recognition system was developed at ORNL for on-line monitoring of noise signals from sensors in a nuclear power plant. The system continuousy measures the power spectral density (PSD) values of the signals and the statistical characteristics of the PSDs in unattended operation. Through statistical comparison of current with past PSDs (pattern recognition), the system detects changes in the noise signals. Because the noise signals contain information about the current operational condition of the plant, a change in these signals could indicate a change, either normal or abnormal, in the operational condition.

32270 (SAND—80-0688) **J-integral elastic plastic fracture mechanics evaluation of the stability of cracks in nuclear reactor pressure vessels.** Gomez, M.P.; McMeeking, R.M.; Parks, D.M. (Washington Univ. Technology Associates, Inc., St. Louis, MO (USA)). Jun 1980. Contract AC04-76DP00789. 81p. (ALO—86; WUTA—7972-04). NTIS, PC A05/MF A01.

Contributions were made toward developing a new methodology to assess the stability of cracks in pressure vessels made from materials that exhibit a significant increase in toughness during the early increments of crack growth. It has a wide range of validity from linear elastic to fully plastic behavior.

32271 **Slope and intercept of the dimensionless velocity profile for artificially roughened surfaces.** Hodge, S.A.; Sanders, J.P.; Klein, D.E. (Oak Ridge Natl Lab, Tenn). *Int. J. Heat Mass Transfer;* **23**: No. 2, 135-140(Feb 1980).

Surface roughening promotes both mixing and heat transfer rates from wall into the fluid. A method is demonstrated for determination of the slope and intercept of the universal velocity distribution law for flow past roughened surfaces without the need for measurement of the velocity profile. The slope is shown to vary with the nature of the roughened surface and in some cases to deviate considerably from that for turbulent flow past smooth walls. 9 refs.

32272 **Neutron transmission testing apparatus and method.** Ballard, C.H.; Kosanke, H.D. (to General Electric Co.). US Patent 4,172,760. 30 Oct 1979. Filed date 6 Dec 1976. 10p.

Apparatus is described for remotely testing radioactive components, for example, the components of a nuclear reactor, by determining and recording the neutron transmission characteristics of the component.

FUEL ELEMENTS

REFER ALSO TO CITATION(S) 32729

32273 **Between-cycle laser system for depressurization and resealing of modified design nuclear fuel assemblies.** US Patent Application 055,209. [nd]. 13p.

A laser beam is used to puncture fuel cladding for release of contained pressurized fission gas from plenum sections or irradiated fuel pins. Exhausted fission gases are collected and trapped for safe disposal. The laser beam, adjusted to welding mode, is subsequently used to reseal the puncture holes. The fuel assembly is returned to additional irradiation or, if at end of reactivity lifetime, is routed to reprocess. The fuel assembly design provides graded cladding lengths, by rows or arrays, such that the cladding of each component fuel element of the assembly is accessible to laser beam reception.

32274 **Fabrication of thorium bearing carbide fuels.** Gutierrez, R.L.; Herbst, R.J.; Johnson, K.W.R. US Patent Application 096,261. [nd]. 14p.

Thorium-uranium carbide and thorium-plutonium carbide fuel pellets have been fabricated by the carbothermic reduction process. Temperatures of 1750°C and 2000°C were used during the reduction cycle. Sintering temperatures of 1800°C and 2000°C were used to prepare fuel pellet densities of 87% and > 94% of theoretical, respectively. The process allows the fabrication of kilogram quantities of fuel with good reproductibility of chemical and phase composition.

32275 (DOE/ET/34026—1) **Sphere-pac fuel development program. First semi-annual progress report, October 1979-March 1980.** Felt, R.E. (Exxon Nuclear Co., Inc., Richland, WA (USA)). May 1980. Contract AC14-79ET34026. 39p. NTIS, PC A03/MF A01.

Development of processes by Exxon Nuclear Company, Inc. for fabricating spherical particle nuclear fuel (sphere-pac) during October 1979 through March 1980 is reported. The program surveyed available technology to develop an initial flowsheet as a design basis for process development. An 0.1 ton/day pilot plant was built to develop and demonstrate the fabrication of sphere-pac fuel. Process and equipment efforts have been directed towards the demonstration of processes and equipment necessary to fabricate sphere-pac fuel on a commercial scale.

32276 (LA—8389-PR) **Fission product release. Progress report, January 1-March 31, 1980.** Norris, A.E. (comp.). (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36;AC06-76RL01830. 18p. NTIS, PC A02/MF A01.

Iron foil was used this quarter to help produce reducing conditions in a basic aqueous environment that resulted in only 0.02 ppB uranium in solution from the dissolution of sintered UO_2, after one week's contact time. This concentration of uranium is the lower limit of detection in our analytical procedure. Additional work with powdered UO_2 to understand the conditions that result in low solubilities of uranium in aqueous solution has resulted in measured uranium concentrations of 8 ppB when hydrogen is used with palladium-black as the reducing agent. Calculations for this system

show that CO_2 in solution is not affecting the results at pH 6 or lower. Electron microprobe analyses of a spent fuel segment have been completed. Plutonium concentrations were higher in the outer 500 μm of the fuel element than in the interior. Strontium, antimony, and cesium did not display any radial trends in concentrations.

32277 (ORNL—5659) **Quantitative differential thermal analysis study of the U_3O_8-Al thermite reaction.** Pasto, A.E.; Copeland, G.L.; Martin, M.M. (Oak Ridge National Lab., TN (USA)). Jun 1980. Contract W-7405-ENG-26. 35p. NTIS, PC A03/MF A01.

Concerns about proliferation resistance of nuclear fuel cycles and fuels have prompted a reinvestigation of U_3O_8-Al cermet fuels currently being used in research and test reactors. In particular, higher loadings of U_3O_8 are being considered. These new fuel compositions are in the region of maximum possible thermal energy release from the high-temperature thermite reaction between the U_3O_8 and aluminum components. This study was initiated to quantitatively measure the amount of reaction heat evolved. A differential thermal analysis system was calibrated with materials of known heat of reaction. Subsequently, specimens of high-uranium-loaded U_3O_8-Al powder mixtures were analyzed. Thermite reaction heat measured for these specimens was much lower than expected. Possible reason(s) for this behavior are discussed in the report.

32278 **Apparatus of assembling fuel rod bundle.** Matsuura, M.; Hidano, T.; Suzuki, M. (to Doryokuro Kakunenryo Kaihatsu Kigyodan). US Patent 4,175,318. 27 Nov 1979. Priority date 22 May 1976, Japan, 12p.

An apparatus is described for assembling a fuel rod bundle having a number of elongated fuel rods arranged in parallel with each other and fixed by means of a plurality of spacers and lower and upper tie plates. The system comprises a fuel rod supplying apparatus for feeding successive fuel rods in a longitudinal direction of the rods, the fuel rod supplying apparatus including means for carrying the rods in a direction perpendicular to the longitudinal direction to any one of a plurality of positions; a bundling apparatus including means for fixing or holding the spacers and the lower tie plate and means for rotating the fixing means by given angles; and a measuring apparatus including a circular pitch measuring mechanism and a layer space or pitch measuring mechanism for measuring circular and layer pitches of the assembled fuel rods in the bundling apparatus.

32279 **Cellular grids with twin ferrules.** Raven, L.F.; Naylor, J.E.; Crossley, B. (to British Nuclear Fuels Ltd.). US Patent 4,172,761. 30 Oct 1979. Priority date 12 Jan 1977, United Kingdom of Great Britain and Northern Ireland (UK), 4p.

A ferrule type nuclear-reactor fuel grid has the two adjacent cells for the respective fuel rods from a single piece of metal strip. A dividing partition between the two cells may be a part of the single piece or a separate piece of strip, In either case the partition carries a resilient member extending into the cell opening to urge a fuel rod inserted therein against fixed stops pressed out of the ferrule wall. By this design a large number of fuel rods may be located in a compact array with a smaller amount of parasitic structural material in the grid.

32280 **Vented nuclear fuel element.** Grossman, L.N.; Kaznoff, A.I. (to Dept. of Energy). US Patent 4,163,689. 7 Aug 1979. Filed date 3 Dec 1965. 4p.

PAT-APPL-512,823.

A nuclear fuel cell is described for use in a thermionic nuclear reactor in which a small conduit extends from the outside surface of the emitter to the center of the fuel mass of the emitter body to permit escape of volatile and gaseous fission products collected in the center thereof by virtue of molecular migration of the gases to the hotter region of the fuel.

CONTROL SYSTEMS

REFER ALSO TO CITATION(S) 32100

32281 (DOE/ID/01570—T6) **Response trees for detection, diagnosis, and treatment of emergency conditions at the LOFT facility.** Nelson, W.R. (Washington Univ., Seattle (USA). Dept. of Nuclear Engineering). 1980. Contract AC07-76ID01570. 163p. NTIS, PC A08/MF A01.

Thesis.

A technique for detecting, diagnosing, and treating emergency conditions has been developed at the LOFT facility. A response tree is a pictorial representation of many different cooling modes which can be used to cool the reactor core. A comprehensive methodology is being developed which will assist the reactor operator in choosing the correct cooling mode, monitoring its performance, and selecting an alternate mode when required. The technique will be implemented using a computer to monitor system status and evaluate the response trees.

32282 (GA-A—15891) **GCFR plant control system.** Estrine, E.A.; Greiner, H.G. (General Atomic Co., San Diego, CA (USA)). May 1980. Contract AT03-76SF71023. 19p. (CONF-800648—3). NTIS, PC A02/MF A01.

From GCFRP program technical review meeting; San Diego, CA, USA (4 Jun 1980).

A plant control system is being designed for a gas-cooled fast breeder reactor (GCFR) demonstration plant. Control analysis is being performed as an integral part of the plant design process to ensure that control requirements are satisfied as the plant design evolves. The load control portion of the plant control system provides stable automatic (closed-loop) control of the plant over the 25% to 100% load range. Simulation results are presented to demonstrate load control system performance. The results show that the plant is controllable at full load with the control system structure selected, but gain scheduling is required to achieve desired performance over the load range.

32283 (HEDL-SA—1995-FP) **Advanced absorber assembly design for breeder reactors.** Pitner, A.L.; Birney, K.R. (Hanford Engineering Development Lab., Richland, WA (USA)). 1980. Contract AC14-76FF02170. 18p. (CONF-800607—63). NTIS, PC A02/MF A01.

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

An advanced absorber assembly design has been developed for breeder reactor control rod applications that provides for improved in-reactor performance, longer lifetimes, and reduced fabrication costs. The design comprises 19 vented pins arranged in a circular array inside of round duct tubes. The absorber material is boron carbide; cladding and duct components are constructed from the modified Type 316 stainless steel alloy. Analyses indicate that this design will scram 30 to 40% faster than the reference FFTF absorber assembly. The basic design characteristics of this advanced FFTF absorber assembly are applicable to large core breeder reactor design concepts.

ENVIRONMENTAL ASPECTS

32284 (ANL/EIS—12) **Determination of compliance with PL 92-500 Section 316(b) for the Donald C. Cook Nuclear Power Plant of the Indiana and Michigan Power Company.** Sharma, R.K.; Freeman, R.F. III. (Argonne National Lab., IL (USA)). Apr 1980. Contract W-31-109-ENG-38. 43p. NTIS, PC A03/MF A01.

Region III of the US Fish and Wildlife Service contracted with the Division of Environmental Impact Studies, Argonne National Laboratory, to make the 316(b) determination for the Donald C. Cook Nuclear Power Plant of the Indiana and Michigan Power Company and to make recommendations for improvement in intake design to facilitate compliance. To conduct this assessment, appropriate literature on screening systems and reports furnished by the applicant on intake design and operation and on ecological studies at the site were reviewed. Modifications of the location and design of the existing intake and possibilities of retrofitting with fine-mesh screening to screen larval forms of fishes were examined. It was determined that currently there is no dictated need for fine-mesh screening of intake flow at the D.C. Cook Nuclear Power Plant.

32285 (UCRL—82234(Rev.1)) **Earthquake engineering programs at the Lawrence Livermore Laboratory.** Tokarz, F.J. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 28 Feb 1980. Contract W-7405-ENG-48. 16p. (CONF-800919—4(Rev.1)). NTIS, PC A02/MF A01.

From 7. world conference on earthquake engineering; Istanbul, Turkey (8 Sep 1980).

Information is presented concerning assessments of current seismic design methods; systematic evaluation program for older operating reactors; seismic vulnerability of fuel reprocessing facilities; and advisability of seismic scram.

RADIOACTIVE EFFLUENTS

REFER ALSO TO CITATION(S) 32319, 32864

RESEARCH, TEST, AND EXPERIMENTAL REACTORS

REFER ALSO TO CITATION(S) 31709, 32233, 32249, 32281, 32283, 32319

32286 (CONF-800719—4) **External attachment of titanium sheathed thermocouples to zirconium nuclear fuel rods for the LOFT reactor.** Welty, R.K. (Exxon Nuclear Co., Inc., Richland, WA

(USA)). 1980. Contract AC07-76ID01570. 8p. NTIS, PC A02/MF A01.

From International symposium of the Society of Photo-Optical Instrumentation Engineers; San Diego, CA, USA (28 Jul 1980).

The Exxon Nuclear Company, Inc., acting as a Subcontractor to EG and G Idaho Inc., Idaho National Engineering Laboratory, Idaho Falls, Idaho, has developed a welding process to attach titanium sheathed thermocouples to the outside of the zircaloy clad fuel rods. The fuel rods and thermocouples are used to test simulated loss-of-coolant accident (LOCA) conditions in a pressurized water reactor (LOFT Reactor, Idaho National Laboratory). A laser beam was selected as the optimum welding process because of the extremely high energy input per unit volume that can be achieved allowing local fusion of a small area irrespective of the difference in material thickness to be joined. A commercial pulsed laser and energy control system was installed along with specialized welding fixtures. Laser room facility requirements and tolerances were established. Performance qualifications, and detailed welding procedures were also developed. Product performance tests were conducted to assure that engineering design requirements could be met on a production basis.

32287 (CONF-800719—5) **Internal attachment of laser beam welded stainless steel sheathed thermocouples into stainless steel upper end caps in nuclear fuel rods for the LOFT Reactor.** Welty, R.K.; Reid, R.D. (Exxon Nuclear Co., Inc., Richland, WA (USA)). 1980. Contract AC07-76ID01570. 15p. NTIS, PC A02/MF A01.

From International symposium of the Society of Photo-Optical Instrumentation Engineers; San Diego, CA, USA (28 Jul 1980).

The Exxon Nuclear Company, Inc., acting as a subcontractor to EG and G Idaho Inc., Idaho National Engineering Laboratory, Idaho Falls, Idaho, conducted a laser beam welding study to attach internal stainless steel thermocouples into stainless steel upper end caps in nuclear fuel rods. The objective of this study was to determine the feasibility of laser welding a single 0.063 inch diameter stainless steel (304) sheathed thermocouple into a stainless steel (316) upper end cap for nuclear fuel rods. A laser beam was selected because of the extremely high energy input in unit volume that can be achieved allowing local fusion of a small area irrespective of the difference in material thickness to be joined. A special weld fixture was designed and fabricated to hold the end cap and the thermocouple with angular and rotational adjustment under the laser beam. A commercial pulsed laser and energy control system was used to make the welds.

32288 (CONF-800804—4) **Dry cooling tower operating experience in the LOFT reactor.** Hunter, J.A. (Idaho National Engineering Lab., Idaho Falls (USA)). 1980. Contract AC07-76ID01570. 7p. NTIS, PC A02/MF A01.

From ASME century 2 emerging technology conference; San Francisco, CA, USA (10 Aug 1980).

A dry cooling tower has been uniquely utilized to dissipate heat generated in a small experimental pressurized water nuclear reactor. Operational experience revealed that dry cooling towers can be intermittently operated with minimal wind susceptibility and water hammer occurrences by cooling potential steam sources after a reactor scram, by isolating idle tubes from the external atmosphere, and by operating at relatively high pressures. Operating experience has also revealed that tube freezing can be minimized by incorporating the proper heating and heat loss prevention features.

32289 (EGG-L—0-00-80-114) **Experimental data report for transient flow calibration facility tests IA101, IA102 and IA103.** Martinell, J.S.; Wambach, J.L.; Crapo, H.S. (Idaho National Engineering Lab., Idaho Falls (USA)). 10 Mar 1980. Contract AC07-76ID01570. 106p. NTIS, PC A06/MF A01.

Thermal-hydraulic response data are presented for the transient performance tests of a modular Drag Disc - Turbine transducer rake (DTT). The tests were conducted in a system which provided full scale simulation of the pressure vessel and broken loop cold leg piping of the Loss of Fluid Test Facility (LOFT). A load cell system was used to provide a reference mass flow rate measurement.

32290 (EGG-RE-A—78-279) **GAMSCAN: ATR fuel plate gamma scanning overcheck computer code.** Matthews, S.D. (EG and G Idaho, Inc., Idaho Falls (USA)). Dec 1978. Contract AC07-76ID01570. 54p. NTIS, PC A04/MF A01.

GAMSCAN is a computer program designed for the INEL CDC 76/173 operating system to check the accuracy of the supplier assigned U-235 values to fuel plates used in elements of the Advanced Test Reactor (ATR).

32291 (HEDL-SA—1874-FP) **FFTF sodium and cover gas characterization and purification.** McCown, J.J.; Bloom, G.R.; Meadows, G.E.; Mettler, G.W. (Hanford Engineering Development Lab., Richland, WA (USA)). Feb 1980. Contract AC14-76FF02170. 25p. (CONF-800401—16). NTIS, PC A02/MF A01.

From 2. international conference of liquid metal technology for energy systems; Richland, WA, USA (20 Apr 1980).

The FFTF Primary and Secondary Heat Transport System (HTS) sodium is purified with cold traps which have packed crystallizers and external economizers. The Primary HTS cold trap is NaK cooled and the Secondary HTS cold traps are air cooled. The FFTF cold traps have maintained high purity in the sodium since sodium fill. Plant operational procedures during fill and initial sodium heatup to 800°F were controlled to assure low release rates of impurities to the sodium. The FFTF sodium systems are monitored by plugging temperature indicators and by several sampling methods. During reactor fill and non-fueled operations at 400 to 800°F, impurity changes in the sodium were followed by continuous plugging indicator coverage, by exposing wires and foils to measure carbon, hydrogen and oxygen, and by bulk sample analysis of all other trace constituents. The sampling and analysis methods and data are presented, impurity excursions in the cover gas and sodium are described, and impurity trends are discussed.

32292 (HEDL-SA—1878-FP) **Packaging and shipment of U.S. breeder reactor experiments.** Berger, J.D. (Hanford Engineering Development Lab., Richland, WA (USA)). 1980. Contract AC14-76FF02170. 7p. (CONF-800592—1). NTIS, PC A02/MF A01.

From International conference on postirradiation examination; The Lake District, UK (13 May 1980).

Irradiation testing of fuels and materials in the Fast Test Reactor (FTR) required development of a shipping cask (designated T-3) and associated hardware for loading and shipping of these experiments to postirradiation examination facilities. The T-3 shipping-cask program included design, fabrication, and testing of internal cask packages to protect the experiments during loading, shipping, and unloading. The cask was designed for loading in both the vertical and horizontal attitudes.

32293 (HEDL-SA—1893-FP) **Oxygen-hydrogen meter assembly for use in remote sodium sampling systems.** Barton, G.B.; Bohringer, A.P.; Yount, J.A. (Hanford Engineering Development Lab., Richland, WA (USA)). Feb 1980. Contract AC14-76FF02170. 8p. (CONF-800401—18). NTIS, PC A02/MF A01.

From 2. international conference of liquid metal technology for energy systems; Richland, WA, USA (20 Apr 1980).

An assembly of an electrolytic oxygen meter and a diffusion type hydrogen meter was designed to fit into the Multipurpose Sampler hardware already installed and operating on the four FFTF sodium systems. One of the key elements in this assembly is a ceramic-metal sealed oxygen sensor which allows use of a metal tube to extend the 51 cm (20 in.) between the sampler top and the flowing sodium region.

32294 (HEDL-SA—1957-FP) **Program for personnel protection from oxygen deficiency in a Fast Breeder Reactor Test Facility (FFTF).** Bell, J.C. (Hanford Engineering Development Lab., Richland, WA (USA)). 12 Dec 1979. Contract AC14-76FF02170. 13p. (CONF-800531—2). NTIS, PC A02/MF A01.

From Industrial hygiene conference; Houston, TX, USA (18 May 1980).

The FFTF reactor is described. Procedures and equipment used to protect personnel from potential hazards of oxygen deficient environments are described.

32295 (HEDL-SA—1999) **Fabrication of FFTF fuel pin wire wrap.** Epperson, E.M. (Hanford Engineering Development Lab., Richland, WA (USA)). Jun 1980. Contract AC14-76FF02170. 12p. (CONF-800607—73). NTIS, PC A02/MF A01.

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

Lateral spacing between FFTF fuel pins is required to provide a passageway for the sodium coolant to flow over each pin to remove heat generated by the fission process. This spacing is provided by wrapping each fuel pin with type 316 stainless steel wire. This wire has a 1.435mm (0.0565 in.) to 1.448mm (0.0570 in.) diameter, contains 17 +- 2% cold work and was fabricated and tested to exacting RDT Standards. About 500 kg (1100 lbs) or 39 Km (24 miles) of fuel pin wrap wire is used in each core loading. Fabrication procedures and quality assurance tests are described.

32296 (HEDL-SA—2007) **Instrumented fuels test for FFTF.** Feigenbutz, L.V.; Hoth, C.W. (Hanford Engineering Development Lab., Richland, WA (USA)). 1980. Contract AC14-76FF02170. 25p. (CONF-800607—62). NTIS, PC A02/MF A01.

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

In support of the LMFBR Fuels Development Program, Hanford Engineering Development Laboratory (HEDL) has designed the Fuels Open Test Assembly (FOTA) for fuels testing at the Fast Flux Test Facility (FFTF). The FOTA is a test vehicle designed to contain and support instrumented fuel experiments in the Fast Test Reactor (FTR) at FFTF. The initial two FOTA experiments will characterize the reference Driver Fuel Assembly performance in the FTR and provide experimental data to evaluate thermohydraulic models used to predict assembly performance. The

design features and fabrication are described for the first two FOTA instrumented fuel experiments, which have been fabricated and are now in the FTR. A brief description of the FOTA test vehicle is included.

32297 (HEDL-SA—2024-FP) **Fuel pin fabrication for the FFTF.** Williams, J.F.; Rice, L.H. (Hanford Engineering Development Lab., Richland, WA (USA)). 1980. Contract AC14-76FF02170. 6p. (CONF-800607—76). NTIS, PC A02/MF A01.

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

Fabrication processes for FFTF fuel pins are described.

32298 (HEDL-SA—2028) **Surveillance and in-service inspection (SISI) program at FFTF.** Conrads, T.J. (Hanford Engineering Development Lab., Richland, WA (USA)). 1980. Contract AC14-76FF02170. 15p. (CONF-800248—1). NTIS, PC A02/MF A01.

From American Nuclear Society conference; Las Vegas, NV, USA (3 Feb 1980).

Assurance of the integrity of the sodium coolant pressure boundaries of the Fast Flux Test Facility systems and components is essential for safe operation. A program has been developed to monitor the integrity of the coolant boundaries and certain plant conditions. Specific equipment and features have been designed into the plant for monitoring. The purpose of SISI is to prevent failures or minimize their consequences through early detection. The program which administers the requirements for monitoring applicable plant conditions whose integrity is necessary to protect public health and safety is known as the Surveillance and In-service Inspection (SISI) Program. The SISI program utilizes a wide range of monitoring techniques to ensure that material degradation or structural deficiencies will not result in the loss of the ability to shut down the reactor, cool the reactor core, or cause the release of radioactive material to the environment.

32299 (HEDL-SA—2040-FP) **FFTF in-containment cell liner design and installation experience.** Umek, A.M.; Swenson, L.D. (Hanford Engineering Development Lab., Richland, WA (USA)). 1980. Contract AC14-76FF02170. 50p. (CONF-800607—77). NTIS, PC A03/MF A01.

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

Design features and liner construction techniques are discussed. Cell leak-rate tests and the methods used to locate and repair leaks are described. A brief analysis of the overall experience at FFTF is provided, with recommendations for future plant designs.

32300 (HEDL-SA—2083) **FFTF utilization for irradiation testing.** Corrigan, D.C.; Julyk, L.J.; Hoth, C.W.; McGuire, J.C.; Sloan, W.R. (Hanford Engineering Development Lab., Richland, WA (USA)). 1980. Contract AC14-76FF02170. 7p. (CONF-800401—25). NTIS, PC A02/MF A01.

From 2. international conference of liquid metal technology for energy systems; Richland, WA, USA (20 Apr 1980).

FFTF utilization for irradiation testing is beginning. Two Fuels Open Test Assemblies and one Vibration Open Test Assembly, both containing in-core contact instrumentation, are installed in the reactor. These assemblies will be used to confirm plant design performance predictions. Some 100 additional experiments are currently planned to follow these three. This will result in an average core loading of about 50 test assemblies throughout the early FFTF operating cycles.

32301 (HEDL-SA—2088-FP) **FFTF fuel systems design criteria.** Dutt, D.S.; Baars, R.E.; Jackson, R.J.; Weber, J.W. (Hanford Engineering Development Lab., Richland, WA (USA)). 1980. Contract AC14-76FF02170. 30p. (CONF-800607—82). NTIS, PC A03/MF A01.

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

The purpose of this paper is to first enumerate the design considerations that were given to the fuel system, then secondly, show how these design allowances, methods, and criteria compare to the subsequent irradiation data. This comparison will show that decisions made by the design team were generally correct and, if in error, tended to be conservative. The FFTF driver fuel assemblies addressed by this paper are composed of the duct, a spacer system, and 217 fuel pins. Each of these subcomponents is described as the criteria are discussed and important parameters noted.

32302 (HEDL-SA—2107-F) **Sodium fill of FFTF.** Waldo, J.B.; Greenwell, R.K.; Keasling, T.A.; Collins, J.R.; Klos, D.B. (Hanford Engineering Development Lab., Richland, WA (USA)). Feb 1980. Contract AC14-76FF02170. 16p. (CONF-800401—27). NTIS, PC A02/MF A01.

From 2. international conference of liquid metal technology for energy systems; Richland, WA, USA (20 Apr 1980).

With construction of the Fast Flux Test Facility (FFTF) completed, the first major objective in the startup program was to fill the sodium systems. A sodium fill sequence was developed to match construction completion, and as systems became available, they were inerted, preheated, and filled with sodium. The secondary sodium systems were filled first while dry refueling system testing was in progress in the reactor vessel. The reactor vessel and the primary loops were filled last. This paper describes the methods used and some of the key results achieved for this major FFTF objective.

32303 (HEDL-SA—2163) **Initial physics measurements on FFTF.** Bennett, R.A.; Daughtry, J.W.; Harris, R.A.; Jones, D.H.; King, T.L.; Midgett, J.C.; Rathbun, J.L.; Rothrock, R.B.; Zimmerman, B.D. (Hanford Engineering Development Lab., Richland, WA (USA)). 1980. Contract AC14-76FF02170. 59p. (CONF-800607—68). NTIS, PC A04/MF A01.

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

Initial criticality of the Fast Flux Test Facility (FFTF) was achieved on February 9, 1980 at 3:45 p.m. During the period November 27, 1979 to March 8, 1980, fuel was loaded into the FFTF core, initial criticality was achieved, and several subcritical physics measurements were performed. The data obtained from initial FFTF nuclear operation are presented. Specifically, the absolute and relative neutron count rates were predicted for the bulk of the seventy-three fuel loadings of FFTF. Agreement between predicted and observed values is illustrated. Severe variations of fission chamber detection efficiency in the reactor shield is contrasted with that near the core center. Control rod worths, measured by the rod drop inverse kinetics method, are compared with predictions based upon Engineering Mockup Critical (EMC) evaluations. Control rod reactivity worth curves measured by rod run-in inverse kinetics are given.

32304 (ORNL/TM—7334) **Bulk shielding facility. Quarterly report, October-December 1979.** Hurt, S.S.; Lance, E.D.; Thomas, J.R. (Oak Ridge National Lab., TN (USA)). Jul 1980. Contract W-7405-ENG-48. 33p. NTIS, PC A03/MF A01.

The Bulk Shielding Reactor (BSR) operated at an average power level of 1899 kW for 78.30% of the time during October, November, and December. Water-quality control in both the reactor primary and secondary cooling systems was satisfactory. The Pool Critical Assembly (PCA) was operated on nineteen occasions for the Pressure Vessel Simulator Benchmark experiment.

32305 (UCRL—52965) **Accuracy of various alternate methods of calculating total mass flow rate for PKL instrumented pipe spool prototype tests in single- and two-phase steam-water flows.** Stein, W. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Dec 1979. Contract W-7405-ENG-48. 17p. NTIS, PC A02/MF A01.

Instrumented spool pieces for installation in the piping of the German Primarkreislauf (PKL) test reactor have been designed and tested. The primary objective of the spools is to provide measurements of two-phase steam-water flow parameters (pressure, temperature, velocity) from which mass flow rates can be calculated. Each spool contains a three-beam densitometer, flow turbine, drag screen, and pressure and temperature sensors. The spools were prototype tested in single- and two-phase steam-water flows and the results of the mass flow calculations were compared to known values. The present software calculations of total mass flow in two-phase flows requires data from two instruments only: the flow turbine and drag screen. In this report, mass flow calculations based on other instrument combinations are investigated and compared to the programmed calculations.

32306 (INEL-tr—51) **Primary report: the effect of externally mounted thermocouples on cladding temperature behavior during blowdown transients. Part II. Experimental procedure and data.** Hain, K.; Bruederle, F.; Vollmer, T. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)). 1980. Translation of Report No. 06-01-07p06B, IT-No. 6/80, April 1980. 102p. NTIS, PC A06/MF A01.

Tests dealing with the effect of LOFT-type thermocouples which are externally mounted on the cladding on the temperature behavior of the rod during a blowdown transient were carried out in the COSIMA Blowdown Test Facility of the Nuclear Safety Project at the KfK [Karlsruhe Nuclear Research Center]. Decisive for the execution of the present tests on the effect of thermocouples on the rod behavior in the COSIMA facility was the possibility provided by that facility for measuring the cladding temperature without influencing the thermodynamic and thermohydraulic conditions on the rod surface; measurement was done with eight pyrometers. At the same time there was the possibility for making a comparison between the cladding temperature measurement with thermocouples and that with pyrometers during the transients. The fuel rod simulator used corresponds in design to the SIM II type rod on the cladding of which four thermocouples were attached by EG and G using the original LOFT assembly method.

PROPULSION REACTORS

REFER ALSO TO CITATION(S) 32333

32307 Reactor safety method. Vachon, L.J. (to Dept. of Energy). US Patent 4,192,714. 11 Mar 1980. Filed date 7 Dec 1966. 4p.

PAT-APPL-600,695.

This invention relates to safety means for preventing a gas cooled nuclear reactor from attaining criticality prior to start up in the event the reactor core is immersed in hydrogenous liquid. This is accomplished by coating the inside surface of the reactor coolant channels with a neutral absorbing material that will vaporize at the reactor's operating temperature.

32308 Nuclear fuel composition. Feild, A.L. Jr. (to Dept. of Energy). US Patent 4,189,398. 19 Feb 1980. Filed date 15 Apr 1965. 6p.

PAT-APPL-448,546.

A high temperature graphite-uranium base nuclear fuel composition containing from about 1 to about 5 weight percent rhenium metal is described.

REACTOR SAFETY

REFER ALSO TO CITATION(S) 31674, 32266

32309 (ALO—83) **Use of risk aversion in risk acceptance criteria.** Griesmeyer, J.M.; Simpson, M.; Okrent, D. (California Univ., Los Angeles (USA). Dept. of Chemical, Nuclear, and Thermal Engineering). Jun 1980. Contract AS04-78ET35400;AC04-76DP00789. 30p. (UCLA-ENG—7970). NTIS, PC A03/MF A01.

Quantitative risk acceptance criteria for technological systems must be both justifiable, based upon societal values and objectives, and workable in the sense that compliance is possible and can be demonstrated in a straightforward manner. Societal values have frequently been assessed using recorded accident statistics on a wide range of human activities assuming that the statistics in some way reflect societal preferences, or by psychometric surveys concerning perceptions and evaluations of risk. Both methods indicate a societal aversion to risk e.g., many small accidents killing a total of 100 people are preferred over one large accident in which 100 lives are lost. Some of the implications of incorporating risk aversion in acceptance criteria are discussed. Calculated risks of various technological systems are converted to expected social costs using various risk aversion factors. The uncertainties in these assessments are also discussed.

32310 (CONF-800723—2) **RELAP4/MOD6 analysis of forced- and gravity-feed reflood tests.** Chen, T.H.; Fletcher, C.D. (EG and G Idaho, Inc., Idaho Falls (USA)). 1980. Contract AC07-76ID01570. 3p. NTIS, PC A02/MF A01.

From 19. national heat transfer conference; Orlando, FL, USA (27 Jul 1980).

The RELAP4/MOD6 computer code is used for the analysis of the reactor core heat transfer during the reflooding phase of a postulated loss-of-coolant accident (LOCA) in a pressurized water reactor (PWR). The code requires the user to specify input parameters for the reflood heat transfer models. Results of previous comparisons of code calculations with experimental data have indicated no single selection of input parameters is adequate for a spectrum of tests and test facilities. This paper presents the development of revised quidelines and assesses the effect of those modifications on RELAP4/MOD6 data comparisons using previously analyzed reflood experiments. The paper also presents an assessment of the revised guidelines and the original guidelines against experimental data significantly different from previously analyzed tests.

32311 (CONF-800723—19) **Review of pertinent thermal-hydraulic data for LMFBR core natural circulation analyses.** Bishop, A.A.; Coffield, R.D. Jr.; Markley, R.A. (Pittsburgh Univ., PA (USA); Westinghouse Electric Corp., Madison, PA (USA). Advanced Reactors Div.). 1980. Contract AC15-76CL02395. 32p. NTIS, PC A03/MF A01.

From 19. national heat transfer conference; Orlando, FL, USA (27 Jul 1980).

A literature review and summary of significant data is presented relative to LMFBR core natural convection cooling analysis. First, a brief review of computer codes and respective input data needs is made, significant data areas are then addressed and data for verifying the code calculations are described. Recommendations and conclusions with regard to the data are included.

32312 (CONF-800909—1) **Ability of the TRAC-P1A computer program to predict blowdown, refill, and reflood phenomena during Semiscale Mod-1 experiments.** Demmie, P.N. (EG and G Idaho, Inc., Idaho Falls (USA)). 1980. Contract AC07-76ID01570. 37p. NTIS, PC A03/MF A01.

From Nuclear reactor safety heat transfer international seminar; Dubrovnik, Yugoslavia (1 Sep 1980).

A computer analysis of a Semiscale Mod-1 Loss-of-Coolant Experiment (LOCE) was performed using the TRAC-P1A computer program. The main purpose of this analysis was to contribute data for the assessment of the ability of TRAC-P1A to predict blowdown, refill, and reflood phenomena during a postulated Loss-of-Coolant Accident (LOCA). A TRAC-P1A Semiscale Mod-1 system model was created and TRAC-P1A was used to obtain initial conditions for Semiscale Mod-1 LOCE S-04-6. After this initialization, TRAC-P1A was used to simulate the first 60 seconds of this experiment. The results of this simulation are presented and discussed.

32313 (EGG/LTR-LO—14-80-069) **L2-6 fuel prepressurization and initial conditions.** Burtt, J.D. (EG and G Idaho, Inc., Idaho Falls (USA)). 19 Jun 1980. Contract AC07-76ID01570. 96p. NTIS, PC A05/MF A01.

One of the major objectives of LOFT LOCE L2-6 is to study the system response to a large primary system rupture when fuel deformation occurs. The original test plan called for fuel which was prepressurized to a typical beginning-of-life pressure, 2.4 MPa, and initial test conditions identical to the conditions used in LOCE L2-3. Based upon L2-3 data, analysis indicates that for these conditions, no fuel deformation can be expected.

32314 (EGG/YBR—81-80) **WRRD monthly report, May 1980.** (Idaho National Engineering Lab., Idaho Falls (USA)). Jun 1980. Contract AC07-76ID01570. 198p. NTIS, PC A07/MF A01.

Technical information and financial data are presented concerning the semiscale program; thermal fuels behavior programs; 2D/3D program; code development and analysis program; code assessment and application program; and construction.

32315 (EGG/YBR—90-80) **WRRD monthly report, June 1980.** (Idaho National Engineering Lab., Idaho Falls (USA)). Jul 1980. Contract AC07-76ID01570. 214p. NTIS, PC A10/MF A01.

Technical information and financial data are presented concerning the semiscale program; thermal fuels behavior programs; 2D/3D program; code development and analysis program; code assessment and application program; and construction.

32316 (HEDL-SA—1981-FP) **Aerosol measurement techniques and accuracy in the CSTF.** McCormack, J.D.; Hilliard, R. K. (Hanford Engineering Development Lab., Richland, WA (USA)). Nov 1979. Contract AC14-76FF02170. 28p. (CONF-800434—6). NTIS, PC A03/MF A01.

From CSNI specialist meeting on nuclear aerosols in reactor safety; Gatlinburg, TN, USA (15 Apr 1980).

The Containment Systems Test Facility (CSTF) provides the capability of performing large-scale aerosol behavior experiments at a scale factor of approximately 0.5 in height for a typical reactor containment building. The containment height is 20.3 m, the volume is 850 m^3, the design pressure is 5 bar, and quantities of sodium up to 1250 kg can be sprayed or spilled for sodium combustion product aerosol sources. Instrumentation is provided for characterization of the aerosol and the containment atmosphere. This paper describes the aerosol sampling techniques and instruments used in the CSTF and discusses their accuracy and reproducibility.

32317 (HEDL-SA—1982-FP) **Comparison of aerosol behavior during sodium fires in CSTF with the HAA-3B code.** Postma, A.K.; Owen, R.K. (Hanford Engineering Development Lab., Richland, WA (USA)). Mar 1980. Contract AC14-76FF02170. 19p. (CONF-800434—7). NTIS, PC A02/MF A01.

From CSNI specialist meeting on nuclear aerosols in reactor safety; Gatlinburg, TN, USA (15 Apr 1980).

Four large-scale tests using sodium fire aerosol sources have been carried out in the Containment System Test Facility (CSTF). Two of the tests employed pool fires and two used spray fires as the aerosol source. Because the CSTF containment vessel is approximately half-scale (20.3 m in height) of a typical reactor building, the CSTF results have provided a large-scale proof test of the HAA-3B Code. For the two pool fire tests, the measured and predicted airborne concentrations were in good agreement when the aerosol source term was based on post-test measurements of aerosol formation, accounting for water vapor uptake.

32318 (HEDL-SA—2012-FP) **HEDL W-1 SLSF experiment LOPI transient and boiling test results.** Henderson, J.M.; Wood, S.A.; Rothrock, R.B. (Hanford Engineering Development Lab., Richland, WA (USA)). 1980. Contract AC14-76FF02170. 36p. (CONF-800607—74). NTIS, PC A03/MF A01.

From American Nuclear Society annual meeting; Las Vegas, NV, USA (8 Jun 1980).

The W-1 Sodium Loop Safety Facility (SLSF) experiment was designed to study the heat release characteristics of fast reactor

fuel pins under Loss-of-Piping-Integrity (LOPI) accident conditions and determine stable sodium boiling initiation and recovery limits in a prototypic fuel pin bundle array. The results of the experiment address major second level of assurance (LOA-2) safety issues and provide increased insight and understanding of phenomena that would inherently terminate hypothesized accidents with only limited core damage. The irradiation phase of the experiment, consisting of thirteen individual transients, was performed between May 27 and July 20, 1979. The final transient produced approximately two seconds of coolant boiling, cladding dryout, and incipient fuel pin failure. The facility and test hardware performed as designed, allowing completion of all planned tests and achievement of all test objectives.

32319 (HEDL-SA—2017-FP) **Evaluation models and their influence on radiological consequences of hypothetical accidents in FFTF.** Stepnewski, D.D.; Hale, J.P.; Martin, H.C.; Peak, R.D.; Franz, G.R. (Hanford Engineering Development Lab., Richland, WA (USA)). Apr 1980. Contract AC14-76FF02170. 23p. (CONF-800434—8). NTIS, PC A02/MF A01.

From CSNI specialist meeting on nuclear aerosols in reactor safety; Gatlinburg, TN, USA (15 Apr 1980).

The influence of radiological evaluation models and assumptions on the off-site consequences of hypothetical core disruptive accidents is examined. The effects of initial source term, time of containment venting, meteorology, biological dose model, and aerosol fallout have been included. The analyses were based on two postulated scenarios of a severe hypothetical reactor vessel melt-through accident for 400 MW(t) fast reactor. Within each accident scenario, the results show that, although other variables are significant, radiological consequences are strongly affected by the amount of aerosol fallout computed to occur in the incident.

32320 (HEDL-SA—2131-FP) **Liquid metal reactions under postulated accident conditions for fission and fusion reactors.** Muhlestein, L.D. (Hanford Engineering Development Lab., Richland, WA (USA)). Apr 1980. Contract AC14-76FF02170. 11p. (CONF-800401—24). NTIS, PC A02/MF A01.

From 2. international conference of liquid metal technology for energy systems; Richland, WA, USA (20 Apr 1980).

Sodium and lithium reactions are considered in the context of a postulated breach of a coolant boundary. Specific topics addressed are coolant-atmosphere and coolant-material reactions which may contribute to the overall consequence of a postulated accident scenario, and coolant reaction extinguishment and effluent control which may be desirable for containment of the spilled coolant.

32321 (LA-UR—80-716) **TRAC posttest calculations of Semiscale Test S-06-3.** Ireland, J.R.; Bleiweis, P.B. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 6p. (CONF-800723—3). NTIS, PC A02/MF A01.

From 19. national heat transfer conference; Orlando, FL, USA (27 Jul 1980).

A comparison of Transient Reactor Analysis Code (TRAC) steady-state and transient results with Semiscale Test S-06-3 (US Standard Problem 8) experimental data is discussed. The TRAC model used employs fewer mesh cells than normal data comparison models so that TRAC's ability to obtain reasonable results with less computer time can be assessed. In general, the TRAC results are in good agreement with the data and the major phenomena found in the experiment are reproduced by the code with a substantial reduction in computing times.

32322 (LA-UR—80-1414) **Light-water reactor safety analysis codes.** Jackson, J.F.; Ransom, V.H.; Ybarrondo, L.J.; Liles, D.R. (Los Alamos Scientific Lab., NM (USA); Idaho National Engineering Lab., Idaho Falls (USA)). 1980. Contract W-7405-ENG-36. 65p. NTIS, PC A04/MF A01.

A brief review of the evolution of light-water reactor safety analysis codes is presented. Included is a summary comparison of the technical capabilities of major system codes. Three recent codes are described in more detail to serve as examples of currently used techniques. Example comparisons between calculated results using these codes and experimental data are given. Finally, a brief evaluation of current code capability and future development trends is presented.

32323 (LA-UR—80-1459) **Computational methods for LMFBR whole-core accident analysis.** Stevenson, M.G.; Jackson, J.F. (Los Alamos Scientific Lab., NM (USA)). 1979. Contract W-7405-ENG-36. 52p. NTIS, PC A04/MF A01.

This chapter discusses the development of current state-of-the-art computational methods used in the United States for analysis of core meltdown accidents (Hypothetical Core Disruptive Accidents) in LMFBRs. The emphasis is on the phenomenological basis and numerical methods of the codes SAS, VENUS-II, SIMMER, and REXCO.

32324 (ORNL/SUB—7537/14) **Safety analysis of thorium-based fuels in the General Electric Standard BWR.** Colby, M.J.; Townsend, D.B.; Kunz, C.L. (General Electric Co., San Jose, CA (USA). Nuclear Energy Div.). Jun 1980. Contract W-7405-ENG-26. 202p. (NEDG—24817). NTIS, PC A10/MF A01.

A denatured (U-233/Th)O_2 fuel assembly has been designed which is energy equivalent to and hardware interchangeable with a modern boiling water reactor (BWR) reference reload assembly. Relative to the reference UO_2 fuel, the thorium fuel design shows better performance during normal and transient reactor operation for the BWR/6 product line and will meet or exceed current safety and licensing criteria. Power distributions are flattened and thermal operating margins are increased by reduced steam void reactivity coefficients caused by U-233. However, a (U-233/Th)O_2-fueled BWR will likely have reduced operating flexibility. A (U-235/Th)O_2-fueled BWR should perform similar to a UO_2-fueled BWR under all operating conditions. A (Pu/Th)O_2-fueled BWR may have reduced thermal margins and similar accident response and be less stable than a UO_2-fueled BWR. The assessment is based on comparisons of point model and infinite lattice predictions of various nuclear reactivity parameters, including void reactivity coefficients, Doppler reactivity coefficients, and control blade worths.

32325 (SAND—79-2179) **Light Water Reactor Safety Research and Development Program. Quarterly report, January-June 1979.** Rios, M. Jr. (comp.). (Sandia National Labs., Albuquerque, NM (USA)). Apr 1980. Contract AC04-76DP00789. 58p. NTIS, PC A04/MF A01.

Information on PWR and BWR reactor safety is presented concerning the Technology Management Center support programs; risk methods utilization; improved component design; improved plant design; seismic program development; man-machine interaction; and unresolved safety issues.

32326 (SAND—80-0373C) **Statistical problems in the assessment of nuclear risks.** Easterling, R.G. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 21p. (CONF-800820—2). NTIS, PC A02/MF A01.

From American Statistical Society meeting; Houston, TX, USA (11 Aug 1980).

Information on nuclear power plant risk assessment is presented concerning attitudinal problems; and methodological problems involving expert opinions, human error probabilities, nonindependent events, uncertainty analysis, and acceptable risk criteria.

32327 (SAND—80-0686) **Prioritization of tasks in the draft LWR safety technology program plan. Final report.** Lim, E.Y.; Miller, W.J.; Parkinson, W.J.; Ritzman, R.L.; vonHerrmann, J.L.; Wood, P.J. (Science Applications, Inc., Monroeville, PA (USA)). May 1980. Contract AC04-76DP00789. 179p. (ALO—84; SAI—123-79-PGH). NTIS, PC A06/MF A01.

The purpose of this report is to describe both the approach taken and the results produced in the SAI effort to prioritize the tasks in the Sandia draft LWR Safety Technology Program Plan. This work used the description of important safety issues developed in the Reactor Safety Study (2) to quantify the effect of safety improvements resulting from a research and development program on the risk from nuclear power plants. Costs of implementation of these safety improvements were also estimated to allow a presentation of the final results in a value (i.e., risk reduction) vs. impact (i.e., implementation costs) matrix.

32328 (SAND—80-1112C) **Time-resolving sampler to determine initial fuel aerosols under CDA conditions.** Elrick, R.M. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 22p. (CONF-800434—4). NTIS, PC A02/MF A01.

From CSNI specialist meeting on nuclear aerosols in reactor safety; Gatlinburg, TN, USA (15 Apr 1980).

Using close-in, time-resolved sampling of fuel debris, high speed photography and photometric measurement of fuel temperatures the kinetic and thermal states of the disrupting UO_2 fuel were defined as it was neutronically heated to vapor by a 5 ms FWHM pulse of 2380 KJ/kg. From these data it was possible to obtain a fuel energy-temperature relation to the melt and debris kinetics in the form of particle distributions in velocity and size for particles from >10 μm to <3 nm in size. Several calculations and comparisons were made to establish the reliability of the sampling and analysis techniques.

32329 (UCRL—84151) **Physical model of lean suppression pressure oscillation phenomena: steam condensation in the light water reactor pressure suppression system (PSS).** McCauley, E.W.; Holman, G.S.; Aust, E.; Schwan, H.; Vollbrandt, J. (California Univ., Livermore (USA). Lawrence Livermore National Lab.; Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht-Tesperhude (Germany, F.R.). Inst. fuer Anlagentechnik). 1 Apr 1980. Contract W-7405-ENG-48. 15p. (CONF-800909—2). NTIS, PC A02/MF A01.

From Nuclear reactor safety heat transfer international seminar; Dubrovnik, Yugoslavia (1 Sep 1980).

Using the results of large scale multivent tests conducted by GKSS, a physical model of chugging is developed. The unique combination of accurate digital data and cinematic data has provided the derivation of a detailed, quantified correlation between the dynamic physical variables and the associated two-phase thermo-hydraulic phenomena occurring during lean suppression (chugging) phases of the loss-of-coolant accident in a boiling water reactor pressure suppression system.

32330 Data specialization for plant specific risk studies. Apostolakis, G. (California Univ., Los Angeles (USA). School of Engineering and Applied Science); Kaplan, S.; Garrick, B.J.; Duphily, R.J. (Packard, Lowe and Garrick, Inc., Irvine, CA (USA)). *Nucl. Eng. Des.;* **56**: No. 2, 321-329(Feb 1980).

Bayes' theorem is used to derive plant specific distributions for the failure rates of components. Methods are suggested for the derivation of generic distributions from information that appears in the literature. These distributions are used as prior distributions in Bayes' theorem and they are modified using plant specific data. The posterior distributions thus derived can be used as inputs in a plant specific risk analysis.

32331 Molten fuel radial motion and cladding melting during a PCM event in LWRs. El-Genk, M.S. (EG and G Idaho, Inc., Idaho Falls (USA). Idaho National Engineering Lab.). *Nucl. Eng. Des.;* **54**: No. 3, 349-377(Nov 1979).

The thermal behavior of the fuel and cladding during off-normal operating conditions, generally termed power-cooling mismatch (PCM), are of great interest to light water reactor (LWR) safety analysis. During a power-cooling mismatch event, fuel melting may begin at the center of the rods propagating radially outward. The induced pressure at the center of the rod due to fuel melting, fission gas release, and UO_2 fuel vapor would tend to force such molten fuel to flow through radially open cracks in the outer unmelted portion of the pellet and relocate in the fuel-cladding gap. The zircaloy cladding, which is at high temperature during film boiling, may undergo melting at its inside surface upon being contacted by the extruded molten fuel, eventually resulting in a thermal failure of the cladding. Three topics of interest are analyzed in this paper. First, fuel conditions during a hypothesized PCM accident are assessed with regard to pellet cracking and central fuel melting. Secondly, the transient freezing of a superheated liquid penetrating an initially empty crack, maintained at constant subfreezing temperatures, is studied analytically. Thirdly conditions for potential melting of zircaloy cladding upon being contacted by the extruded molten fuel are investigated analytically.

32332 (DOE-tr—151) **Theoretical investigations of the meltoff and resolidification process of fuel claddings during accidents in liquid metal cooled fast breeder reactors.** Angerer, G. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik). Sep 1979. Translation of KFK—2662, August 1978. 160p. NTIS (US Sales Only), PC A08/MF A01.

Thesis. Work performed under United States-W. Germany Fast Reactor Exchange Program.

During loss-of-coolant-flow accidents in liquid metal cooled fast breeder reactors with failure to scram, the fuel claddings will melt after boiling and evaporation of the coolant. The CMOT model presented in this publication describes the subsequent process of relocation and resolidification of the molten claddings. The basic thermohydrodynamic equations of the two-phase flow of cladding material and sodium vapor are solved numerically by differential approximations in a Eulerian reference net.

32333 Atmospheric burnup of the Cosmos-954 reactor. Krey, P.W. (Dept. of Energy, New York, NY); Leifer, R.; Benson, W.K.; Dietz, L.A.; Hendrikson, H.C.; Coluzza, J.L. *Science;* **205**: 583-585(10 Aug 1979).

On 24 January 1978 the Russian satellite Cosmos-954 reentered the atmosphere over northern Canada. By use of high-altitude balloons, the atmosphere was sampled during 1978 up to an altitude of 39 kilometers to detect particulate debris from the reactor on board the satellite. Enriched uranium-bearing aerosols at concentrations and particle sizes compatible with partial burnup of the Cosmos-954 reactor were detected only in the high polar stratosphere.

32334 Protection of nuclear power plants from external explosions. Jokela, S.; Maier, H. (Brown, Boveri and Co. Ltd., Baden (Switzerland)). *Brown Boveri Rev.;* **66**: No. 8, 560-564(Aug 1979).

In Switzerland and in the Federal Republic of Germany power plant design takes into account the effects of pressure loads resulting from the explosion of an external gas cloud, irrespective of the geographical location of the plant. This contribution analyzes the types and effects of explosions occurring in the open air, and emphasizes the protective measures for buildings and systems in accordance with Swiss licensing practice. The effects of shocks upon the components are taken into account in a similar way to those arising from earthquakes or an aeroplane crash. Since the structure design generally covers the pressure loads due to explosions and aeroplane crashes, additional measures are usually only required to prevent the pressure wave and the gas mixture from entering the interior of buildings containing safety-related systems. Such loads can also occur in other industrial plants. The experience described in this article may therefore also be applied to other engineering projects.

32335 (DOE/CEA/BMFT—1) **Human factors: human failures and incidents. Application to the St. Laurent power stations, SL1 and SL2. Report DSN No. 283.** Griffon, M. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Surete Nucleaire). [nd]. 28p. (In French). NTIS (US Sales Only), PC A03/MF A01.

The aim of this report is to show human factors having an effect upon the safety of an installation. So, we are searching for human failures and for their causes in executive tasks. These causes may belong to the following categories: design of the work station, physical environment, social environment, work time, staff training, psychological and physiological characteristics of the operator. Identification of human failures and causes in executive tasks may be carried out by two complementary methods: starting from incidents and rebuilding the incident genesis; and starting from work situation and searching for elements which could generate human failures. In order to apply the first method, an incident reporting system that is managed by the Department of Nuclear Safety (DSN) was used. Since the reporting system was created to analyze human factors in safety, it was necessary to complete the reports by a complementary information or a questionnaire dealing with the search for causes of human failures. If this questionnaire is applied to each incident caused by human failures, it is then possible to set up a data bank for human factors. It is pointed out that the selection of incidents for refined analysis is a key phase of the study.

ENERGY STORAGE

REFER ALSO TO CITATION(S) 32197

COMPRESSED GAS

REFER ALSO TO CITATION(S) 31864

PUMPED HYDRO

REFER ALSO TO CITATION(S) 31864

FLYWHEELS

REFER ALSO TO CITATION(S) 31864

32336 (UCRL—50056-79) **Mechanical energy storage technology project. Annual report for calendar year 1979.** Barlow, T.M.; Crothers, W.T.; King, D.M.; Rinde, J.A.; Chiao, T.T.; Kulkarni, S.V.; Frank, D.N. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 1 May 1980. Contract W-7405-ENG-48. 153p. NTIS, PC A08/MF A01.

The aim of the mechanical energy storage technology (MEST) project at LLL is to demonstrate its potential for energy savings in vehicular and stationary systems. Primary emphasis is on flywheel energy storage systems. In-house research and development work includes development and evaluation of the tapered-thickness flywheel rotor concept and characterization of fiber-composite materials for application to flywheel systems. The Project's CY 1979 activities were organized into the following tasks: transportation applications; photovoltaic and wind applications; fiber-composite materials technology; flywheel rotor and containment technology; advanced component technology; and project management and DOE support. Status of the projects is summarized.

THERMAL

REFER ALSO TO CITATION(S) 32058, 32060, 32061, 32062, 32406

32337 (LBL—10889) **Experimental and theoretical studies of thermal energy storage in aquifers.** Tsang, C.F.; Molz, F.J.; Parr, A.D. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.).

May 1980. Contract W-7405-ENG-48. 6p. (CONF-800806—33). NTIS, PC A02/MF A01.

From 15. intersociety energy conversion engineering conference; Seattle, WA, USA (18 Aug 1980).

A coupled experimental and theoretical study of thermal energy storage in an aquifer is described. Water at an average temperature of 55°C is stored in a confined aquifer near Mobile, Alabama. Approximately 55,000 m^3 of water was injected, stored, and then produced for two consecutive cycles. Data obtained were used to validate a numerical model, CCC. This model, developed at Lawrence Berkeley Laboratory, is able to calculate heat and fluid flow in a three-dimensional, liquid-saturated system. Without adjusting any parameters, the calculated results reproduce closely the observed data. The energy recovery factor of 66% for the first cycle and 76% for the second cycle indicate that the aquifer may be a very promising thermal energy storage medium. Furthermore, the thermohydrological processes involved appear to be properly accounted for by the numerical model, thus giving us some confidence in the current state-of-the-art in the performance forecast of future aquifer energy storage projects.

32338 (LBL—11059) **Energy storage in aquifers: a survey of recent theoretical studies.** Tsang, C.F.; Claeson, J. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.; Lund Univ. (Sweden)). Mar 1980. Contract W-7405-ENG-48. 9p. (CONF-8006102—1). NTIS, PC A02/MF A01.

From Rockstore 80 conference; Stockholm, Sweden (23 Jun 1980).

The disparity between energy production and demand has led to increased research into the use of aquifers for the long-term, large-scale storage of thermal energy. Currently, there are several field experiments and feasibility studies under way in which the technical, economic, and environmental aspects of aquifer storage are being researched. Recent theoretical efforts in aquifer storage research and the impact their results may have on these field projects are reviewed. Major work is highlighted according to three categories: (1) semianalytic studies, (2) numerical modeling studies, and (3) site-specific studies.

BATTERIES

DESIGN AND DEVELOPMENT

REFER ALSO TO CITATION(S) 32196

32339 (EPRI-EM—1346) **Using statistically designed experiments in development of advanced battery systems.** Basin, S.L.; Spindler, B. (Science Applications, Inc., Palo Alto, CA (USA); Electric Power Research Inst., Palo Alto, CA (USA)). Feb 1980. 126p. NTIS, PC A07/MF A01.

This report shows that the determination of significant effects resulting from planned variations in experimental conditions can be implemented easily in two-level factorial designs and in calculations emphasizing analysis of variance techniques. Actual case studies and discussions of selected reports on battery projects are used as examples. These also illustrate the significant additional advantages of statistically designed experimental planning and analysis compared to one-of-a-kind, uncontrolled experiments. A typical example of the latter approach is examined, in which the lack of a statistical plan is shown to have resulted in excessive work, drawing wrong conclusions, and having no estimates of the uncertainties in the data. The material in this report applies to many other fields of experimentation, as in studies of factors that may affect the outcome of industrial procedures. It should be most useful to experimentalists who recognize the need for better results than obtainable from ordinary one-at-a-time and baseline test methods. 18 figures, 18 tables.

32340 **Electrochemical battery.** Ruch, J.; Hasenauer, D. (to Accumulatorenwerk Hoppecke Carl Zoellner and Sohn). US Patent 4,169,190. 25 Sep 1979. Priority date 12 Feb 1977, German, Federal Republic of (F.R. Germany), 8p.

An electrochemical battery for production of high outputs and efficiencies with high current densities comprises a plurality of cells, particularly metal-air cells, each comprising a consumable electrode, an air electrode spaced from the consumable electrode with electrolyte disposed in an electrolyte space, and current take-off. The consumable electrode has a rod-shape and is made at least partially of a dense metal. The consumable electrode has a front face constituting a sole working surface and projects sealed-off into the electrolyte space. An air electrode is spaced by the smallest distance parallel to the working surface of the consumable electrode. An adjustable mounting for one of the electrodes maintains the spacing between the electrodes constant. The cells are arranged parallel to one another and connected in series, the air electrode and the consumable electrode of each of the cells being reversed with respect to the consumable electrode and the air electrode of the adjacent cell. 2 figures, 1 table.

32341 **Sodium/sulfur traction batteries: a review of progress and problems in their development.** Dell, R.M.; Jones, R.J. (UKAEA Harwell Lab., Oxfordshire, England). pp 29-37 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Sodium/sulfur batteries based on beta alumina as solid electrolyte have been under intensive development for thirteen years. In Europe the emphasis has been on traction batteries for road vehicles and railway applications. This paper presents an overview of recent progress, particularly in the UK, and attempts to set this in the framework of problems remaining to be solved. Recent developments in cell design and construction are reviewed first, followed by a consideration of each of the major components in turn. The importance of materials science and technology in determining the electrical performance and durability of cells is emphasized. The overall objective of producing a cell of high energy density and low cost, which is reliable and maintains its capacity for a long life, and which is guaranteed safe in use is seen to be a formidable technical challenge. An inter-disciplinary team approach has resulted in cell designs which are well on the way to meeting this specification, although much detailed work remains to be done before success is assured. Several battery experiments of increasing scale, up to 10 kWh, have been conducted to obtain information on the electrical behavior of series/parallel arrays of cells. Safe operation of these batteries has been achieved by incorporating safety design features into the cells. Further development work on batteries will require the provision of large numbers of cells, and pilot plant production facilities for these are now being installed.

32342 **Advanced battery program at General Electric.** Asher, J.A. (General Electric Co., Schenectady, NY). pp 39-45 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

This paper reviews the status of GE's sodium-sulfur battery development program. A brief background of the utility load-leveling energy storage options is given. The program activities summarized include: (1) cell component scale-up; (2) safety and performance testing; and (3) battery system design. Particular emphasis is given to the development of the beta alumina solid electrolyte.

32343 **Electrochemical studies of lithium intercalation in titanium dichalcogenides.** Thompson, A.H. (Exxon Research and Engineering Co., Linden, NJ). pp 47-51 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Systematic and precise studies of the voltage composition relation were made on lithium intercalation in TiS_2, $TiSe_2$ and $Ti_{1}S_2$. The stoichiometric materials exhibit evidence for the formation of ordered Li intercalates as recently reported for Li/sub x/TiS_2. The metal-rich compounds $Ti_{1}S_2$, with randomly intercalated Ti atoms, shows no Li ordering effects. These systematic studies give the first data of use in extracting the various contributions to the composition-dependent free energy of formation of the lithiated compounds.

PERFORMANCE AND TESTING

REFER ALSO TO CITATION(S) 32346, 32356

32344 (BMFT-FB-T—80-031) **Research and development work on the self-discharge of cells with negative electrodes consisting of lithium and a lithium alloy.** Knoedler, R.; Boehme, G.; Heide, H. (Battelle-Institut e.V., Frankfurt am Main (Germany, F.R.)). Jul 1980. 32p. (In German). NTIS (US Sales Only), PC A03/MF A01.

Galvanic cells of the type LiAl/FeS, LiAl/FeS_2 and Li/sub x/Si/FeS have been built, and thier self-discharge behavior was investigated. The work showed that the self-discharge rate of LiAl/FeS cells is below 1% (capacity loss per day). It decreases during cell operation. The rate is low even if the cells are cycled. If the cell atmosphere contains air, the self-discharge rate increases considerably. Cells of the type Li/sub x/Si/FeS exhibited a higher self-discharge rate than LiAl/FeS cells. The investigations showed that, as far as the self-discharge behavior is concerned, industrial use of LiAl/FeS batteries is feasible. 13 figures.

32345 (SAND—79-2156C) **Glass-to-metal seal corrosion in lithium-sulfur dioxide cells.** Bunker, B.C.; Leedecke, C.J.; Levy, S.C.; Crafts, C.C. (Sandia Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 19p. (CONF-800917—2). NTIS, PC A02/MF A01.

From 12. power sources conference; Brighton, UK (15 Sep 1980).

Hermetically sealed Li/SO_2 cells experience glass corrosion during long-term storage of discharge. Premature failure of the cells can result from cracking of the glass with subsequent release of SO_2, or from the formation of a low-resistance parasitic load across the seal. The corrosion was investigated by placing battery headers containing borosilicate glasses in closed ampules with the acetonitrile-LiBr-SO_2 electrolyte. Lithium metal was attached to the outer conductor of the headers to protect the steel case from attack. The corrosion started at the case and progressed toward the pin. Seal failure was predicted when ~ 30% of the glass was corroded. An underpotential deposition model was used to describe the corrosion. 3 figures, 3 tables.

MATERIALS, COMPONENTS, AND AUXILIARIES

REFER ALSO TO CITATION(S) 32345, 32617

32346 (ANL/OEPM—80-1) **Galvanostatic polarization of zinc microanodes in KOH electrolytes.** Liu, M.B.; Cook, G.M.; Yao, N.P. (Argonne National Lab., IL (USA)). May 1980. Contract W-31-109-ENG-38. 37p. NTIS, PC A03/MF A01.

This report includes a critical review of the current literature on the anodic passivation of zinc electrodes, a description of supplementary experimental studies to extend the data to a low-current-density region and to provide a basis for evaluating conflicting results of published work, and a new interpretation of the anodic passivation mechanism. This work provides a starting point for understanding passivation phenomena in battery electrodes. The utilization of a zinc electrode in alkaline batteries depends on the ability of the electrode to remain active during the anodic dissolution process. This dissolution period is often terminated by the onset of passivation. Experiments were conducted on the effects of current density on passivation time of a small zinc anode (6.6×10^{-3} cm^2) in KOH at concentrations of 0.784, 2.92, 4.98 and 7.24M KOH as well as 7.24M KOH saturated with zinc oxide. It was concluded that there are two mechanisms for anodic passivation, one occurring at current densities below about 150 mA/cm^2 and another at higher current densities. Accordingly, in the overall mechanism, the total time to passivation includes the times to achieve the maximum zincate concentration as well as to form porous type I ZnO and compact type II ZnO. In Ni/Zn batteries under development for vehicle propulsion, the electrolyte is usually 30% KOH (7M) saturated with zinc oxide; and the zinc electrode is formed in-situ by electrodeposition of zinc onto the grid. For a current density of 20 mA/cm^2 in a Ni/Zn battery cycled at a 2-h rate and a zinc electrode with a porosity of 0.6 at the fully charged state, a current density of 338 mA/cm^2 was calculated to be that above which the passivation limits the utilization of the zinc electrode. 7 figures, 4 tables.

32347 (BMFT-FB-T—80-032) **Research and development in the field of sodium sulfur batteries. Long-lived beta alumina electrolytes, prepared according to an optimized spray decomposition process.** Knoedler, R.; Ammende, S.; Beck, H.P.; Klawik, R.; Kuhn, W.; Merz, F. (Battelle-Institut e.V., Frankfurt am Main (Germany, F.R.)). Jul 1980. 36p. (In German). NTIS (US Sales Only), PC A03/MF A01.

At present β-Al_2O_3 is produced by the conventional process, i.e., by solid state reaction of the carbonates and oxides. The objective of this work was to establish an alternative process. For this purpose a process for the thermal decomposition of nitrate solutions (spray decomposition) was developed. It turned out that ceramics of a fine-grained structure and with a homogeneous distribution of the components could be made from powders produced by this process. Tubes prepared from this powder showed long lifetimes without degradation in Na/β-Al_2O_3/Na cells, even at current densities of up to 2000 mA/cm^2. Thus, a process for the production of β-Al_2O_3 is available, which can serve in every respect as an alternative process to the one currently used. 8 figures.

32348 **Fast ion transport in solids: electrodes and electrolytes.** Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979). 771p. (CONF-790538—).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Topics covered in the conference include: energy storage and other applications; electrode materials and intercalated compounds; diffusion; ionic conductivity techniques; neutron scattering and diffraction techniques; beta aluminas; deuterium and NH_4; NASICON and other sodium ion conductors; lithium ion conductors; silver and copper ion conductors; anion conductors; and high conductivity glasses. Thirty-five individual items were prepared separately for the data base. (GHT)

32349 **Disposable battery packing for charged and dumped batteries.** Nees, J.M. (to General Battery Corp.). US Patent 4,170,692. 9 Oct 1979. Filed date 12 Jan 1978. 6p.

A novel battery package is described wherein a sealing strip having a plurality of minute vent holes, one for each opening in the battery case, is retained in place by a plurality of disposable inserts that retain the strip in place and seal the strip, at least around the top surface of each of the battery case venting ports. Each of the inserts is equipped with a vent aperture, a portion of which is surrounded on its top surface by raised indicia that extend to the periphery of the inserts. An adhesive strip is applied to engage each disposable insert to form a circuitous venting passage between them. The strip also engages the sealing strip, as well as the edges of the battery case, in such a manner that, upon activation, the entire battery package may be removed and disposed of by loosening one end of the sealing strip and pulling that strip up and across the top of the battery to expose each of the fill holes for activation.

32350 **Hermetically sealed alkali metal battery container.** Chase, G.G.; Harlow, R.A.; Gupta, V.K. (to Ford Aerospace and Communications Corp.). US Patent 4,170,694. 9 Oct 1979. Filed date 4 Dec 1978. 6p.

This disclosure relates to a hermetically sealed alkali metal battery container. The battery includes a ceramic ring having upper and lower contoured surfaces located on its outer circumferential surface. Outer metal casings defining an upper battery container and a lower battery container are formed so as to have a bell-shaped open end on each one. The bell-shaped open end of respective casings are located adjacent the contoured surfaces formed on the ceramic ring. Each bell-shaped open end of a metal casing has associated with it a sealing band that engages the open end of the casing to compress it into engagement with an associated contoured surface of the ceramic ring to form a hermetic seal.

32351 **Layer and tunnel compounds: fast ion transport and electrochemical energy storage.** Whittingham, M.S. (Exxon Research and Engineering Co., Linden, NJ). pp 17-22 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Electrochemical systems are needed for the reversible storage of electrical energy to be used in utility load leveling, electric vehicle propulsion, solar electric storage, and electronic devices. The key components in batteries that require fast ion transport in the solid state are the electrolyte and the electronegative electrode, the cathode. Characterization of these components requires a knowledge of their structure, thermodynamics and ion kinetics. The solid electrolyte beta alumina is discussed first with particular emphasis on the role of ionic radius on mobility. Then the reactions of lithium with the layered compounds TiS_2, VSe_2 and V_2O_5 and various tunnel structures are described.

32352 **Evaluation of properties related to the application of fast ionic transport in solid electrolytes and mixed conductors.** Huggins, R.A. (Stanford Univ., CA). pp 53-59 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

In solid electrolytes, most attention is often given the magnitude of the ionic conductivity. However, their practical utilization is often limited by restricted ranges of chemical potentials over which they are thermodynamically stable and conduct charge primarily by ionic transport. This matter, and techniques for its evaluation will be discussed. Especially interesting are mixed conductors in which mobile ionic species enter static host crystal lattices. The chemical diffusion coefficient controls the rate of insertion. Several techniques involving the use of galvanic cells to evaluate chemical diffusion in mixed conductors will be discussed.

32353 **Ambient temperature solid state batteries.** Owens, B.B.; Skarstad, P.M. (Energy Technology, Minneapolis, MN). pp 61-67 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Conceptually, ambient temperature solid electrolytes would permit the design of batteries exhibiting enhanced operating characteristics. Lithium cells based upon $LiI(Al_2O_3)$ exhibit a high energy density at very low power levels, and are expected to deliver 0.8 Wh/cc in cardiac pacemakers. The requirement of 80 μW average power drain for five to ten years isothermal (37°C) conditions has been effectively met by solid state batteries. Further improvements in this area of battery technology will result from solid electrolyte materials that simultaneously exhibit fast ion conductvity, high decomposition potentials and compatibility with rechargeable electrode materials.

32354 Fabrication of β''-Al_2O_3 tubes from cast ceramic tape. Dirstine, R.T. (Globe-Union Inc., Milwaukee, WI). pp 79-82 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Most conceptions of the sodium/sulfur batteries for commercial use in electric vehicles or stationary energy storage applications show in each cell tube-shaped sodium ion-conducting ceramic electrolyte. Presently such tubes are fabricated by one of several batch ceramic processes based on electrophoresis or isostatic pressing. These methods of production cause the electrolyte component to be inherently costly and are limited to their ability to produce thin-walled tubes, which is reflected in higher internal resistance and reduced performance of the battery. An alternative approach is proposed for fabricating thin wall (~ 0.3 mm) β''-Al_2O_3 tubes from cast ceramic tape. The fabrication process and characteristics of the fired tubes are described.

32355 Processing and properties of sodium β''-alumina and NASICON ceramic electrolytes. Miller, G.R. (Ceramatec, Inc., Salt Lake City, UT); McEntire, B.J.; Hadnagy, T.D.; Rasmussen, J.R.; Gordon, R.S.; Virkar, A.V. pp 83-86 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

The sodium superionic conductors sodium β''-alumina and NASICON($Na_3Zr_2PSi_2O_{12}$)have been processed as polycrystalline forms under varying processing conditions. Several properties have been measured and include mass density, sodium ion electrical resistivity, thermal expansion coefficient, fracture strength, microstructural character, long and short term stability to liquid sodium and water. Advantages and disadvantages of several processing methods and an initial comparison of the properties of polycrystalline sodium β''-alumina and NASICON are made.

32356 Degradation of rapid ion conductors under electrolytic conditions. Virkar, A.V.; Miller, G.R. (Univ. of Utah, Salt Lake City). pp 87-90 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Strength degradation of sodium β''-alumina is examined as a function of temperature. Sodium - β'' -sodium cells with tubular electrolytes have been constructed and operated at current densities up to 4.5 amps/cm^2 without immediate failure. Critical current densities over which degradation occurs are examined in light of the theoretical model presented previously. The role of electrolyte size as well as the wetting characteristics of β''-alumina by sodium are discussed in light of the proposed model and implications regarding cell design are presented.

32357 Heat treatment of beta-alumina. (Chloride Silent Power Ltd., Runcorn, England). pp 91-94 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

A detailed study of the effects of heat treatment on three beta-alumina compositions is presented. For two of the compositions improvements in ionic conductivity can be correlated with increases in the volume fraction of the more condutive β''-phase and a coarsening of the microstructure. The third composition shows little change in ionic conductivity even at heat treatment temperatures which produce a large improvement in conductivity in the other two compositions. However, this composition is less susceptible to secondary grain growth than the other two compositions. The reasons for these differences in behavior are discussed.

32358 Sodium β''-alumina at high current density. Hunt, T.K.; Weber, N.; Cole, T. (Ford Motor Co., Dearborn, MI). pp 95-97 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Ceramic β''-alumina electrolytes operated in Na-S or Na-Na cells exhibit an apparent critical current density in the range of 0.5 to 1 A/cm^2 above which rapid degradation and failure of the electrolyte occurs. Specific tests were conducted in which ionic current densities up to 15 A/cm^2 were passed by β''-alumina of 1 mm wall thickness with no apparent change in the current-voltage relation. In contrast to the usual situation in Na-Na cells or in the recharging of Na-S cells, these conditions never involve the presence of a liquid sodium sodium phase at the exit surface of the ceramic. The results demonstrate that for ionic current densities an order of magnitude greater than the critical, no intrinsic instability of β''-alumina occurs.

32359 Low temperature degradation in the solid state. Owens, B.B.; Untereker, D.F.; Skarstad, P.M. (Energy Technology, Minneapolis, MN). pp 105-107 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Solid state cells of the Ag/$RbAg_4I_5$/QI_3 or QI_5, where Q^+ represents the tetramethylammonium ion, were stored for five years at 71°C, 23°C and -15°C. The set stored at -15°C showed significant increases in resistance when the $RbAg_4I_5$ electrolyte was formulated with small amounts of both powdered silver and $Rb_2Ag_4I_5$ (Set A); this suggests that some of the $RbAg_4I_5$ disproportionated into the more resistive AgI and Rb_2AgI_3 phases. In contrast, cells which lacked Rb_2AgI_3 in the electrolyte (Set B) did not increase in resistance. Microcalorimetric measurements at 37°C were made on cells from Set A. Batteries stored at -15°C had endothermic outputs of ~6 μwatt, consistent with reversal of the decomposition reaction.

32360 Use of low frequency ac measurements in solid state electrochemistry. Boukamp, B.A.; Raistrick, I.D.; Huggins, R.A. (Stanford Univ., CA). pp 1177-180 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

A new technique is described which allows the accurate measurement of the electrical impedance of an electrochemical system at very low frequencies. The sinusoidal excitation signal and the response of the sample are compared over a single period, using a small on-line computer, by means of an algorithm based on the first term of the Fourier transformed signals. The relationships between the amplitudes and phase of the excitation and response are then calculated and displayed as a complex impedance. An example is given of the application of this technique to the study of the kinetics of the electrochemical injection of lithium into thin tungsten trioxide films.

32361 Four probe ac bridge conductivity measurements for fast ion conductors. Friauf, R.J. (Univ. of Kansas, Lawrence). pp 181-184 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

The 2 or 3 terminal ac bridge techniques often used for ionic conductivity measurements do not allow for lead wire corrections, which may be appreciable when sample resistances become less than 10 Ohm for fast ion conductors. Hence a four probe technique has been developed for use with a shielded transformer arm capacitance bridge. The principle is straightforward: the average of two balances, with reversed connections for standard and sample resistances, eliminates all lead resistances completely. The method has been used at high temperatures on AgBr, where the conductivity rises to 1 $\Omega^{-1}cm^{-1}$, and will be applied to Ag β-alumina in connection with low temperature diffusion measurements.

32362 Interacting Brownian particles in a periodic medium. Bishop, A.R. (Los Alamos Scientific Lab., NM); Dieterick, W.; Peschel, I. pp 199-201 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

In superionic conductors a situation can arise where the motion of ions cannot be described in terms of a discrete hopping process. For treating the low-frequency dynamics a liquid-like model defined by a diffusion equation (Smoluchowski-equation) for many particles subject to pair forces and to a periodic single particle force due to the regular arrangement of counterions is employed. Various approximation schemes are used to study the low frequency conductivity. Explicit results are given for moderate densities and various forms of the pair potential.

ENERGY MANAGEMENT AND POLICY

32363 (DOE/EIA—0203/4) Recent Products of Applied Analysis, May-July 1980. Issue No. 4. Cleggett, P. (Department of Energy, Washington, DC (USA). Energy Information Administration). Jul 1980. 25p. NTIS, PC A02/MF A01.

This publication, Recent Products of Applied Analysis, is from the Office of Applied Analysis. This office is within the Energy Information Administration (EIA), US Department of Energy. One

of its responsibilities is to promote a better understanding of the Nation's energy situation. In a continuing effort to meet that challenge, this listing is provided. It compiles abstracts of Applied Analysis reports published since April 1980. This listing is published four times a year.

ENERGY ANALYSIS AND MODELING

REFER ALSO TO CITATION(S) 31580, 31581, 31582, 32188, 32197, 32434, 32438, 32443, 32444, 32462, 32481

32364 (BNL—51138) **New York State energy-analytic information system: first-stage implementation.** Allentuck, J.; Carroll, O.; Fiore, L. (State Univ. of New York, Stony Brook (USA). Inst. for Energy Research; Brookhaven National Lab., Upton, NY (USA). National Center for Analysis of Energy Systems). Sep 1979. Contract AC02-76CH00016. 307p. NTIS, PC A14/MF A01.

So that energy policy by state government may be formulated within the constraints imposed by policy determined at the national level - yet reflect the diverse interests of its citizens - large quantities of data and sophisticated analytic capabilities are required. This report presents the design of an energy-information/analytic system for New York State, the data for a base year, 1976, and projections of these data. At the county level, 1976 energy-supply demand data and electric generating plant data are provided as well. Data-base management is based on System 2000. Three computerized models provide the system's basic analytic capacity. The Brookhaven Energy System Network Simulator provides an integrating framework while a price-response model and a weather sensitive energy demand model furnished a short-term energy response estimation capability. The operation of these computerized models is described. 62 references, 25 figures, 39 tables.

32365 (CONF-800835—1) **Highlights of the ORNL-model evaluation methodology and the evaluation of LEAP.** Weisbin, C.R.; Alsmiller, R.G. Jr. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 20p. NTIS, PC A02/MF A01.

From Symposium on energy modeling III: dealing with energy uncertainty; Chicago, IL, USA (4 Aug 1980).

This paper describes progress made at the Oak Ridge National Laboratory toward development and demonstration of a methodology for evaluating energy-economic modeling codes and important results derived from these codes. To bolster traditional evaluation methods with more quantitative procedures of interest to the Office of Validation Analysis of EIA, ORNL is applying sensitivity theory as part of a comprehensive effort to quantify the importance of various data and model parameters to key results of interest. Two types of sensitivity-analysis approaches, screening and adjoint perturbation theory, are discussed. Other essential program elements described in some detail include computational experience, assessment of model structure and rationale, and evaluation of the model input data. Preliminary findings from application of this approach to the Long-Term Energy Analysis Program (LEAP) used in obtaining projections (Model 22C) for the 1978 EIA Annual Report to Congress are presented.

ECONOMICS AND SOCIOLOGY

REFER ALSO TO CITATION(S) 31586, 31843, 32391, 32393, 32404, 32411, 32468, 32478, 32496

32366 (BNL—51140) **Intergroup welfare comparisons using aggregate consumption data.** Jorgenson, D.W.; Lau, L.J.; Stoker, T.M. (Brookhaven National Lab., Upton, NY (USA). National Center for Analysis of Energy Systems). Aug 1979. Contract AC02-76CH00016. 27p. NTIS, PC A03/MF A01.

In this paper, the distributional impact of President Carter's domestic-oil-price decontrol program on different groups of households in the economy, distinguished by income, age of head of household, size of household, region (Northeast, North Central, South, and West), residential location (urban/rural), and race (white/non-white), is explored. The specific question being addressed is: how much additional disposable income (called compensating variation, which may be negative) should be given to each group of household in order that its level of satisfaction remains the same as in the absence of the President's decontrol program. By comparing these compensating variation numbers across households, it is possible to infer the distribution of welfare gains and losses among households as a result of the decontrol program. The analysis shows that, on the whole, rural households are made much worse off than urban households (holding income and other attributes constant). The white households are made worse off than the non-white households (again, holding income and other attributes constant), but not by much. In terms of regional impact, the South is best off, followed by the West, followed by the Northeast. North Central requires the largest compensation. Low-income households ($8000) are hurt much more proportionately than high-income households ($17,000). The methodology employed is new, is perfectly general, and can be applied to the synthetic-fuels program or the conservation program or any combination of the two to determine the welfare-distribution consequences. 4 references, 9 tables.

32367 (P—300-80-026) **Comparing California energy options: an application of societal scenarios. Consultant report.** Carlson, R.C.; Harman, W.W.; Rosener, L.D.; Thomas, T.C. (SRI International, Menlo Park, CA (USA)). Jun 1980. 65p. California Energy Commission, Sacramento.

The position of the California Energy Commission is difficult in that the technical decisions it is called on to make turn out to be intimately related to broad societal value-laden choices. Furthermore, the Commission is called on to act as designated decision maker in situations of public controversy wherein the decision tends to be a societal-system decision over which no single agency has decisive control - even though there may seem to be a designated cognizant agency. The scrapping of the Kaiparowits project is cited as an example of where none of the key groups involved made the final decision; rather, it was a decision of the overall societal system, strongly affected by changing cultural attitudes over the 13-year lifetime of the project. Many of the situations in which the Energy Commission is designated decision maker turn out to have this same characteristic, namely, that - regardless of surface appearances - the ultimate decision is actually made by the overall societal system. As if recognizing these points, the Commission in its second biennial report moved in the direction of using what are, in effect, partial scenarios (an overall energy-supply strategy) to aid in guiding its decisions. This report, by SRI International, simply carries that development one or two steps farther in proposing that the Commission formally incorporate whole societal scenarios into its decision-making process, using them as (1) an aid in creating a decision environment conducive to making coordinated energy-related policy decisions, and (2) a key element in a systematic framework for making specific energy technology and project decisions.

32368 (P—300-80-027) **California energy futures: two alternative societal scenarios and their energy implications.** Carlson, R.C.; Everett, S.J.; Harman, W.W.; Krause, K.W.; Levy, S.; Mandel, T.F.; Meagher, P.C.; Rosener, L.; Schwartz, P.; Thomas, T.C. (SRI International, Menlo Park, CA (USA)). Jun 1980. 194p. California Energy Commission, Sacramento, CA.

America's ongoing debate about energy has led to an increasingly comprehensive view of the close links between energy systems and most, if not all, social and economic activity. At the same time, decisions about energy are moving away from the sole domain of a few large private and public organizations. Now they increasingly involve many public and private groups, stakeholders with often diverse and conflicting perspectives, and individuals of all backgrounds and political persuasions. But few analytic tools are both broad enough to explain the great complexity inherent in energy issues and nontechnical enough to be widely useful for making choices. This report, based on an approach using societal scenarios, seeks to illuminate California's energy future and the energy choices that can be made today by relating them to the broader context of social, economic and technological change and the many choices individuals make about their lifestyles. Described in this report are two alternative societal scenarios of California's future. Their main purpose is to describe the range of options Californians have for making energy choices and indicate how these are related to other choices. Because of a gradual and moderate divergence in values and lifestyles, the two scenarios come, over a 70-year period, to two very different socieites and energy systems.

32369 (PNL—28174) **Energy industry's involvement in housing.** Metz, W.C. (Brookhaven National Lab., Upton, NY (USA)). Jul 1980. Contract AC02-76CH00016. 18p. NTIS, PC A02/MF A01.

The energy industry is committing large amounts of capital to a wide range of energy development projects. The fiscal consequences of any schedule delays are mounting, and companies are recognizing that it is in their own best interests to invest time and capital in socio-economic impact management actions. One of the most critical impacts has been housing - for workers and for the community as well. Of the attempts to help alleviate the shortages, some have been successful and some have failed; there are still other possibilities that have not been conceived or implemented yet. Any venture into the housing field that an industry may contemplate must be carefully deliberated and the possible consequences noted. Whether supply or stimulation initiatives are to be used, the eight-step decision checklist should be consulted, other area industries met with, worker wants understood, and the advice of local, regional, company, and consultant planners solicited in order to ensure community future well being and a good quality-of-life for the worker. 12 references.

32370 **Interregional energy substitution in manufacturing in the United States.** Uri, N.D. (DOE, Washington, DC). *Energy Convers.;* **19**: No. 1, 25-31(1979).

A translog price possibility frontier is applied to a pooled sample in order to measure the extent of energy substitution effects in manufacturing industries. The results clearly indicate that relative changes in energy prices have significant effects on consumption. This, in turn, has important implications for public policy. In particular, the market system appears better able to deal with exogenous shifts in energy supplies than has frequently been assumed in the formulation of public policies toward the energy crisis. 12 refs.

ENVIRONMENT, HEALTH, AND SAFETY

REFER ALSO TO CITATION(S) 32188, 32373, 32380, 32818, 32819

32371 (LBL—11177) **Legal and institutional aspects of regulating intermedia pollution.** Entman, R.M. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). May 1980. Contract W-7405-ENG-48. 84p. NTIS, PC A05/MF A01.

Intermedia pollution is defined here as the creation of new environmental impacts by controlling existing ones. DOE asked four questions: (1) do the major environmental laws address intermedia pollution; (2) does the Environmental Protection Agency (EPA) have rules, regulations, and procedures through which it considers intermedia questions; (3) do the legislative histories of the laws indicate whether Congress intended for the EPA to consider intermedia issues; and (4) in what ways do the existing laws and regulatory procedures exacerbate intermedia pollution. The answer to the first three questions is yes; much of this report is devoted to amplifying and qualifying that response, the rest to answering the fourth question. The report frames these issues by asking how we can control the adverse environmental i.e., intermedia, impacts of EPA itself. A case study of the intermedia implications of recently issued air-pollution standards for coal-fired power plants illustrates the themes concretely. An analysis of policy alternatives for improving intermedia pollution control concludes the study. The major problems impending good intermedia policy decisions are: conflicts among and failures fully to implement environmental laws; political pressures; tendencies of EPA to minimize the adverse environmental consequences of its own actions; uncertainties caused by the rudimentary scientific understanding of intermedia pollution; and limitations on EPA's organizational ability to handle whatever complex intermedia information it does obtain. The final chapter assesses three policy responses to these problems: do nothing new; issue an incremental prod; and a new law and EPA suffice. Evaluation of these alternatives depends on how deficient current practices are thought to be.

32372 (NP—24981) **Ordinance for the realization of the Federal Act for the Protection Against Nuisances (accident ordinance).** (Bundesrat, Bonn (Germany, F.R.)). Feb 1980. 38p. (In German). NTIS (US Sales Only), PC A03/MF A01.

The Accident Ordinance is concerned with the implementation of the Federal Act for the Protection Against Nuisances. It defines plants that need to be licensed, dangerous materials, accidents, and the population hazards involved. It states protection duties, and asks for a safety analysis and a publication of the accident. It also demands an accident investigation commission.

NATURAL RESOURCES

REFER ALSO TO CITATION(S) 31557, 32189, 32523, 32524

32373 (CED—80-82) **Changes in public-land management required to achieve Congressional expectations.** (General Accounting Office, Washington, DC (USA)). 16 Jul 1980. 218p. GPO.

Report to the Congress by the Comptroller General of the United States.

Public-land managers in the Departments of Agriculture and the Interior are having difficulty achieving congressional expectations of producing the natural resources the Nation needs - timber, grazing forage, minerals, energy, etc. - while protecting the environment and conserving sufficient resources for the future. GAO recommends legislative and administrative changes which, together with agency actions already underway, should lead to: (1) realistic assessments of resource supplies and demands; (2) resource-production goals consistent with production capabilities and conservation and environmental restrictions; (3) better resource inventories and forest- and rangeland-management plans; (4) effective links between land-management plans and annual budgets; (5) stronger and more-effective programs for regulating public-land users and maintaining facilities and resources; and (6) a proper balance between the agencies' land-management responsibilities and capabilities.

32374 (CONF-800380—, pp 5p, Paper 2) **Energy and development.** Gururaja, J. 1980.

From 3. international trade exhibition and congress for oil, gas, chemical and process engineering industries; Bombay, India (16 Mar 1980).

The developing countries will require higher per capita energy for improving the quality of life. This paper examines the goals and strategies for development vis-a-vis those of the developed countries. Crucial issues in India are listed. The role of technology in the utilization of energy is discussed. Difficulties in choosing the technology are pointed out. The problem of integrating several alternative energy sources in villages is mentioned. Environmental issues are considered. (DLC)

32375 (CONF-800380—, pp 5p, Paper 3) **Creation and conservation of energy in Japan.** Hoashi, K. 1980.

From 3. international trade exhibition and congress for oil, gas, chemical and process engineering industries; Bombay, India (16 Mar 1980).

Japan needs to increase alternatve energy supply by the year 2000. For the development of new energy sources, the Sunshine Project was initiated; it covers solar, geothermal, and coal liquefaction. For conservation of energy, the Moonlight Project was also begun. Some data on the schedules and budgets are given. 4 tables. (DLC)

32376 (CONF-800380—, pp 6p, Paper 7) **India's contribution in fulfilling the energy needs of third countries: present as well as future.** Bhargava, R.C. (Bharat Heavy Electricals Ltd., New Delhi, India). 1980.

From 3. international trade exhibition and congress for oil, gas, chemical and process engineering industries; Bombay, India (16 Mar 1980).

A combiation of skilled manpower, infrastructural development, and a sound industrial base puts India into a position for meeting not only the energy needs of developing countries, but for assiting them in their all-around development. This paper is confined to energy: petroleum, noncommercial energy sources, hydroelectric, electrical equipment, etc. (DLC)

32377 (CONF-800380—, pp 10p, Paper 8) **India's energy needs and areas of international cooperation.** Wazir, S.N. (Delhi Polytechnic, India). 1980.

From 3. international trade exhibition and congress for oil, gas, chemical and process engineering industries; Bombay, India (16 Mar 1980).

India's energy position is poor because of relatively large imports of oil, and poor reserves. In the impending energy crisis, developing countries will suffer (whether or not it is oil-rich) unless international cooperation is forthcoming. Energy consumption patterns in India are shown in tables. Energy reserves are also analyzed, including nonconventional sources (geothermal, solar, etc.). Possible areas for international cooperation are explored. (DLC)

RESEARCH, DEVELOPMENT, DEMONSTRATION, AND COMMERCIALIZATION

REFER ALSO TO CITATION(S) 32389, 32475, 32478, 32515

32378 (BNL—51167) **Energy Technology Programs: program summaries for 1979.** (Brookhaven National Lab., Upton, NY (USA)). Dec 1979. Contract AC02-76CH00016. 48p. NTIS, PC A03/MF A01.

The Energy Technology Programs in the BNL Department of Energy and Environment cover a broad range of activities, namely: electrochemical research, chemical energy storage, chemical heat pumps, solar technology, fossil technology, catalytic systems development, space-conditioning technology, and technical support/program management. Summaries of the individual tasks associated with these activities along with publications, significant accomplishments, and program funding levels are presented.

32379 (DOE/ER—0060) **Basic research needs in seven energy-related technologies, conservation, conversion, transmission and storage, environmental fission, fossil, geothermal, and solar.** (Department of Energy, Washington, DC (USA)). Jul 1980. 209p. NTIS, PC A10/MF A01.

This volume comprises seven studies performed by seven groups at seven national laboratories. The laboratories were selected because of their assigned lead roles in research pertaining to the respective technologies. Researches were requested to solicit views of other workers in the fields.

32380 (EPA—600/9-78-023) **Federal non-nuclear energy R and D program. Public hearing transcript.** (Environmental Protection Agency, Washington, DC (USA). Office of Energy, Minerals and

Industry). Jul 1978. 486p. Environmental Protection Agency, Washington, DC.

Hearings were conducted to examine issues relating to energy development and environmental protection. Sessions on March 29, 30, and 31, 1978 covered future energy patterns and coal use, energy conservation and solar programs, and synthetic fuels and oil shales, respectively.

32381 (NP—25007) **Progress report, January 1-December 31, 1979.** (Koeln Univ. (Germany, F.R.). Energiewirtschaftliches Inst.). 1979. 28p. (In German). NTIS, (U.S. Sales Only), PC A03/MF A01.

The Institute submits for the first time a progress report covering a whole year, i.e., a period which also corresponds to the financial year of the Society for the Advancement of the Institute for Energy Management. This annual report will replace the existing six-month-reports and will give members of the Society the opportunity to follow the financial development parallel to the activities of the Institute. The progress report 1979 gives detailed information on the staff and its development, teaching, activities, publications, lectures, studies, consulting, contacts, and theses.

32382 (P—102-79-003) **Exploring new energy choices for California: the 1979/80 R and D report to the Legislature. Volume II. Project descriptions.** (California Energy Commission, Sacramento (USA)). Jun 1979. 111p. California Energy Commission, Sacramento.

The past, present, and proposed research and development activities of the California Energy Commission are described. The energy development program contains the following elements: solar, geothermal, fuels, and special projects. The energy resources conservation program contains a commercial/industrial element. The regulatory and planning program contains the energy and electricity planning element.

32383 (SERI/RR—744-451) **Decentralized energy studies: compendium of international studies and research.** Wallace, C. (Friends of the Earth, San Francisco, CA (USA). International Project for Soft Energy Paths). Mar 1980. Contract AC02-77CH00178. 73p. NTIS, PC A04/MF A01.

The purpose of the compendium is to provide information about research activities in decentralized energy systems to researchers, government officials, and interested citizens. The compendium lists and briefly describes a number of studies in other industrialized nations that involve decentralized energy systems. A contact person is given for each of the activities listed so that interested readers can obtain more information.

NUCLEAR ENERGY

REFER ALSO TO CITATION(S) 31620, 31630, 32221, 32261, 32330, 32334

32384 (CONF-800380—, pp 5p, Paper 5) **Contribution of nuclear power to India's energy needs.** Kati, S.L. (Rajasthan Atomic Power Project, Kalpakkam, India). 1980.

From 3. international trade exhibition and congress for oil, gas, chemical and process engineering industries; Bombay, India (16 Mar 1980).

The development of nuclear power in India is reviewed. The following plants are discussed: Tarapur, Rajasthan, Madras, and Narora. Performance of Tarapur and Rajasthan is also reviewed briefly. Cost, safety, and future program are discussed. 4 tables. (DLC)

32385 **Turnkey era in nuclear power.** Burness, H.S. (Univ. of New Mexico, Albuquerque); Montgomery, W.D.; Quirk, J.P. *Land Econ.;* **56**: No. 2, 188-202(May 1980).

The turnkey era is viewed as a temporary deviation from the traditional pattern of conventional contracting that arose because of the informational problems associated with scaling of nuclear reactors to commercial size. General Electric's decision to offer turnkey contracts at a cost competitive with coal units was a decision to invest in a private demonstration program with prospective quasi-rents from later-generation reactors. Competition from Westinghouse kept turnkey prices at levels that increased investment costs for both GE and Westinghouse, and cut into profits in the post-turnkey era. The return to conventional contracting was a natural development, which occurred as soon as the reactor manufacturers had obtained sufficient orders to provide the scaling information they required. The return was natural because the incentive structure of the regulated utility industry encourages risk taking on the part of utilities in their contracting for capital goods. The preference of utilities for conventional over turnkey contracts contributed to the post-turnkey boom in nuclear orders, which occurred before bottlenecks and other difficulties caused such massive cost increases that the economic merits of nuclear power became questionable. 8 references, 5 tables.

32386 **Motorway threat to nuclear democracy.** Grove-White, R. *New Sci.;* **85**: No. 1198, 840-841(13 Mar 1980).

The wider implications of Britain's nuclear power programme of the recent ruling in the House of Lords against objectors to the M40 and M42 motorways are discussed. In combination with the UK government's stated intentions this judgement is seen as a move toward planning methods more closed and autocratic than those to which United Kingdom residents have hitherto been accustomed.

32387 **Weaknesses in Nuclear Power Commission's basis material.** *Tek. Ukebl.;* **126**: No. 27, 6(21 Jun 1979). (In Norwegian).

TRANSPORT AND STORAGE

REFER ALSO TO CITATION(S) 32197, 32406, 32517

WASTE HEAT UTILIZATION

REFER ALSO TO CITATION(S) 31871, 32187, 32427, 32465, 32489, 32500, 32501, 32502

CONSERVATION

REFER ALSO TO CITATION(S) 31571, 32375, 32391, 32392, 32399, 32433, 32434, 32442, 32449, 32457, 32462, 32466, 32470, 32471, 32472, 32473, 32474, 32475, 32484, 32485, 32486, 32496, 32497, 32507, 32508, 32509, 32510

32388 (CONF-800380—, pp 9p, Paper 4) **Energy conservation-problems and perspectives for developing nations.** Srinivasan, P.R. (National Productivity Council, New Delhi, India); Padrmanabhan, S. 1980.

From 3. international trade exhibition and congress for oil, gas, chemical and process engineering industries; Bombay, India (16 Mar 1980).

While studies of the past indicated a tight coupling of energy consumption and GNP, longer range indications are that they can be mutually decoupled. Developing nations can move forward towards achieving significant energy savings in their economics without fear of economic stagnation. Conservation policies at the national level are difficult to enunciate and the implementation mechanisms have to be strengthened. Macro-level economics may not be easily apparent as unit level economics. If energy conservation is not practiced, we would require the development of additional energy supply capacity with all of its economic implications. The role of science and technology inputs in industrial processes for minimizing energy consumption is significant. Sufficient funds should be allocated for pursuance of R and D activities in energy conservation and in developing alternative energy resources to supplement and later replace the existing costly transient fuels. A climate to promote conservation of energy should formulate policies which lays emphasis on energy conservation strategies rather than soley on energy growth issues. The effort should be directed towards energy programs that are a judicious mix up of energy and energy conservation strategies for achieving economic growth and a reasonable standard of living commensurate with the aspirations of the people. In capital-scarce economies, an account of the fact that energy conservation requires far less investment than energy capital supplies, conservation policies must play a central role in the overall framework of developing nation's national energy policies.

32389 (LBL—11219) **Energy conservation and energy decentralization: issues and prospects.** Levine, M.D.; Craig, P.P. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Jan 1980. Contract W-7405-ENG-48. 28p. (CONF-800111—5). NTIS, PC A03/MF A01.

From Annual conference of the American Association for the Advancement of Science; San Francisco, CA, USA (4 Jan 1980).

Views are presented of the seemingly paradoxical nature and irrationality of the energy system and the decisions that determine its evolution. An economic approach to energy decisions, while widely espoused and generally believed to be the underpinning of our system, appears not to be functioning in very-important areas. The result is enormous waste of economic and intangible resources to produce energy that could be effectively replaced by energy conservation at low costs. This inefficiency in the economic system is, in the author's judgment, far greater than is recognized either by the public or by experts. They feel it has led to an over-investment in centralized energy systems and has discouraged the use of decentralized systems that could contribute significantly in the near term to a lessening of our energy problems. There are some signs that the situation is changing, albeit rather slowly. High prices and the widespread recognition of the seriousness of our energy problems have contributed to an increasing involvement of individuals in energy decisions profoundly affecting their future. To achieve an

evolution of the energy system in which decentralized technologies (and, in the near term, particularly technologies that improve the efficiency of energy use) play an important role, the government must act forcefully. This action needs to recognize and be responsive to the powerful discriminatory effect of the economic system, as it is presently constituted, against investments in energy conservation.

SUPPLY, DEMAND, AND FORECASTING

REFER ALSO TO CITATION(S) 31576, 31630, 32364, 32367, 32368, 32402, 32403, 32407, 32408, 32410, 32435, 32464

32390 (DOE/CS/54269—01) **Emergency fuels utilization guidebook. Alternative Fuels Utilization Program.** (Southwest Research Inst., San Antonio, TX (USA)). Aug 1980. Contract AC01-78CS54269. 193p. NTIS, PC A09/MF A01.

The basic concept of an emergency fuel is to safely and effectively use blends of specification fuels and hydrocarbon liquids which are free in the sense that they have been commandeered or volunteered from lower priority uses to provide critical transportation services for short-duration emergencies on the order of weeks, or perhaps months. A wide variety of liquid hydrocarbons not normally used as fuels for internal combustion engines have been categorized generically, including limited information on physical characteristics and chemical composition which might prove useful and instructive to fleet operators. Fuels covered are: gasoline and diesel fuel; alcohols; solvents; jet fuels; kerosene; heating oils; residual fuels; crude oils; vegetable oils; gaseous fuels.

32391 (DOE/SF/12076—1) **Energy self-sufficiency for the big Island of Hawaii. Final report.** Kinderman, E.M.; Duffey-Armstrong, M.; Brown, K.D.; Dickenson, R.L.; Jones, J.L.; Meagher, P.C.; Rao, M.; Schooley, F.A.; Short, W.D.; Trexel, C.A. (SRI International, Menlo Park, CA (USA)). Jan 1980. Contract FG03-78SF12076. 174p. NTIS, PC A08/MF A01.

Analysis and evaluation of the energy needs and energy resources of the Island of Hawaii are presented. Development of a program to permit substantial development of the Island's economy while energy imports are constrained is described. The Island resources - sun, wind, and geothermal heat - can all supply energy to replace imported fuels. The sugar industry, dependent on solar energy, is forecast to become a supplier of fuel through the production of alcohol from molasses. Presently, the Island makes use of biomass (cane) which contributes about 37% of the Island's primary energy requirements. Chapter III sets forth background data on energy consumption; Chapter IV discusses conservation potentials; Chapter V describes a wide variety of energy technologies, including status and economics. Chapter VI discusses environmental and social aspects of the primary technology, followed by three chapters on the scenarios and evaluation methods. Results of community evaluation and the accepted scenarios and final implementation plans are described.

32392 (DOE/SF/12076—2) **Energy self-sufficiency for the big Island of Hawaii. Appendices. Final report.** Kinderman, E.M. (SRI International, Menlo Park, CA (USA)). Jan 1980. Contract FG03-78SF12076. 231p. NTIS, PC A11/MF A01.

Appendix A lists members of the Hawaii County Energy Advisory Committee. Appendix B deals with the energy self-sufficiency plan for the county of Hawaii (energy demand patterns and projections). Appendix C presents background data and analysis of conservation in residential, commercial, and industrial sectors with notes on electric generation, transmission, and distribution on the Island of Hawaii. Additional appendices contain information on study contacts; scenarios; letter describing action to be taken for study of the scenarios; and model calculations.

32393 (EPRI-EA—1215(Vol.2)) **Analytical framework for evaluating energy and capacity shortages. Final report.** Mosbaek, E.J. (Faucett (Jack) Associates, Inc., Chevy Chase, MD (USA)). Apr 1980. 138p. NTIS, PC A07/MF A01.

A methodology for estimating shortage cost is presented, and two examples of shortage costs are given, namely: the 1976-1977 winter shortfall in natural-gas supply, and a 1978 spot shortage in electric power. The methodology shows how to develop a comprehensive estimate of willingness-to-pay to avoid shortages - a total comprised of the willingness-to-pay producers, employees, consumers, and the general public. The 1976-1977 natural gas experience indicates that total costs per million Btu's of shortage (i.e., the cost for every Mcf of curtailment to non-residential users who are not normally curtailed) are $54 and $5 for capacity and energy shortages, respectively. The dielectric power shortage indicates that total costs per million Btu's of shortage are $670 (i.e., a cost of $2.30 for every kWh of shortage to non-residential users).

32394 (P—102-80-010) **Independent staff energy-demand forecast for consideration in the proceedings on the Third Biennial Report.** (California Energy Commission, Sacramento (USA)). 3 Jun 1980. 165p. California Energy Commission, Sacramento.

Every two years the state's major electric utilities submit their forecasts of electricity demand and facility plans to the Commission. This report presents the Energy Commission staff's independent forecast of the potential for future growth in demand for electricity and natural gas as a prelude to preparation of the third Biennial Report (BR III). It concludes that statewide growth in electricity demand from a base year of 1978 to the year 2000 will be 1.75% per year for sales and 1.64% per year for peak. Electricity demand is expected to be as high as forecast in the Commission's second Biennial Report through the 1980's, but then tail off slightly in the last decade of the century. Natural gas demand is forecast to grow very slowly, rising annually at 0.5% from 1979-1985 and 0.52% from 1979-2000. The differences between the new staff forecast and the adopted forecast are more pronounced than they are for electricity. The new forecast is 424 MMCF/day (9.7%) below the adopted forecast by 2000. The difference is largely due to the higher prices now expected for natural gas. This report contains the staff's most recent assessment of future energy demand, a comparison of the staff's new forecasts and adopted BR II forecasts, and brief description of the changes in staff's methods since BR II, including sensitivity cases and a discussion of major assumptions.

32395 (P—500-80-006) **Comparative evaluation of nontraditional energy resources.** (California Energy Commission, Sacramento (USA)). Feb 1980. 131p. California Energy Commission, Sacramento.

This report discusses a method for expanding energy-supply planning to consider energy resources not traditionally included, such as geothermal, solar, and wind energy, biomass, small hydroelectric projects, and cogeneration. To illuminate their comparative characteristics, the staff employed a rather simply method applicable to all the technologies. A composite profile of costs, relative probability of implementation, potential for use, timing of implementation, and impediments to use was compiled. The analysis is divided into time horizons of 1979, 1985, 1991, and 2000. The analysis of implementation probability is based on an explicit set of criteria. The scoring system is presented in a format that allows reviewers both to understand the basis of the ratings, and to test the sensitivity of conclusions to alternative assumptions. The report is not intended to serve the purposes of a utility-supply-planning exercise, but rather seeks to illuminate policy options and facilitate choices among them. Insights from this analysis do, however, contribute to the ability to compare nontraditional options to conventional utility resources for meeting energy-demand growth. A first application of the method has shown that alternative energy sources can make a major contribution to meeting California's energy needs by the year 2000. To realize the achievable potential of these new energy sources, however, additional actions are required from many groups proceeding on multiple fronts. Key actions required to accelerate use of the technologies of greatest near-term interest are described.

32396 **Dynamics of energy substitution in California manufacturing, 1958-1976.** Faruqui, A. Palo Alto, CA; Electric Power Research Institute (1979). 142p. (NP—25006).

Thesis. Submitted to Univ. of California, Davis.

A new approach to analyzing energy substitution in the industrial sector is developed. The approach relaxes the assumption of a homogeneous capital stock which characterizes most work on the subject. Capital plant and equipment purchased in different periods are permitted to have different energy- and labor-use characteristics. The notion of incremental optimization is developed and used to derive demand equations for energy, capital, and labor, conditional on factor prices and output levels. These equations distinguish the new demand for energy, arising from the operation of newly purchased capital from the old demand arising from the operation of capital purchased in earlier periods. A new interpretation of long-run elasticities emerges from the incremental-model specification. Unlike short-run elasticities, which can be regarded as pure technological parameters, long-run elasticities additionally depend on the vintage composition of capital. Thus, they reflect the history of factor prices as much as they represent technology. The incremental model is successfully estimated for 12 California industries at the two-digit SIC code level, using time series data over the 1958-1976 time frame. For comparability, traditional static and dynamic models which do not distinguish between capital vintages are also estimated over the same data base. Short-term energy-substitution elasticities are found to be roughly similar across the incremental and traditional specifications. Long-term substitution possibilities differ considerably, however; not only the magnitude but also the sign of the long-run elasticity, such as that between energy and capital, is observed to be sensitive to the choice of model specification. 102 references, 6 figures, 21 tables.

32397 **Role of basic research in energy development.** Kane, J.S. (Dept. of Energy, Washington, DC). pp 7-13 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.;

Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

The United States problem number one is the increasing price of readily available energy. This is causing severe economic difficulties with Americans, who refuse to live within their energy means, and to the developing world, which has insufficient means to live within. The second problem is one of very difficult time constants. The supply of cheap and convenient fuels we now rely on is finite, and we face the very real and difficult problem of bringing on the new source in time to permit a smooth transition from current depleting sources. Our energy system is huge, expensive and pervasive. To change it from its current reliance on gas and petroleum to the new sources will require enormous effort, and a corresponding long lead time. All new sources of energy will be very expensive, in comparision with today's energy costs. All have very difficult technical problems. Along with this need for new sources of supply, there is the need to totally reconfigure the ways in which Americans use energy. America developed when energy was cheap; it is not surprising that we consume inefficiently. Yet redesigning the end-use part of the energy system is also a process of long time constants. The sum of all these requirements is nothing less than a total restructuring of our energy system, in some ways, our lives. To do this in time, and at an ultimate cost, both economic and environmental, that we can afford will challenge all parts of our society, including the scientific enterprise. The role of basic research is to examine carefully the scientific opportunities related to the impediments to new sources, the difficulties with present ones, and inefficiencies in the ways we consume. Some of the more critical research needs in the different areas of technology are reviewed, and benefits such research could bring are illustrated.

POLICY, LEGISLATION, AND REGULATION

REFER ALSO TO CITATION(S) 31492, 31577, 31618, 31787, 32364, 32366, 32372, 32389, 32411, 32456, 32503

32398 (CONF-800380—, pp 4p, Paper 1) **India's energy needs.** Prasad, N.B. 1980.

From 3. international trade exhibition and congress for oil, gas, chemical and process engineering industries; Bombay, India (16 Mar 1980).

Only a small portion (15%) of India's commerical energy requirements is imported, but this import accounts for nearly 75% of total imports. Noncommercial energy (firewood, agricultural waste, cow dung) will still have an important role in the future. The major thrust of India's energy policy should be to ensure that energy will not be a constraint to economic growth, and to increase the per capita energy consumption. In the future, hydroelectric and nuclear power will become increasingly important. Solar energy will also be utilized. (DLC)

32399 (P—160-79-002) **Warren-Alquist State Energy Resources Conservation and Development Act, Public Resources Code Section 25000 et seq.** (California Energy Commission, Sacramento (USA)). Dec 1979. 109p. California Energy Commission, Sacramento.

Incorporated are all amendments to the Act through 1979.

The text of the Act is presented, and all amendments to the Act through 1979 are included. The 12 chapters are: Title and General Provisions; Definitions; State Energy Resources Conservation and Development Commission; Planning and Forecasting; Energy Resources Conservation; Power Facility and Site Certification; Research and Development; Energy Shortage Contingency Planning; State Energy Resources Conservation and Development Accounts; Enforcement and Judicial Review; Gas Appliances; and Solar Shade Control.

FOSSIL FUELS

REFER ALSO TO CITATION(S) 31582

COAL

REFER ALSO TO CITATION(S) 31458, 31492, 31512, 31538, 31543, 31553

32400 (DOE/EIA—0173(79)/2) **Annual report to Congress. Volume 2. Data.** (Department of Energy, Washington, DC (USA). Energy Information Administration). 1979. 279p. NTIS, PC A13/MF A01.

Data on the total energy picture of the USA for 1979 are presented. Also included are data on international energy resources and movements of petroleum and natural gas. A list of energy equivalents has been provided. Many current and historical features of the energy scene are presented. Energy supply, disposition, production, consumption, and trade are covered. Financial data are included. Subsection titles include: petroleum and natural gas resources, exploration, development, and reserves; petroleum supply and disposition; natural gas supply and disposition; coal supply and disposition; electricity supply and disposition; nuclear power supply and disposition; solar and geothermal energy; and miscellaneous energy indicators (motor vehicle registrations, home heating, etc.). (DC)

PETROLEUM

REFER ALSO TO CITATION(S) 31557, 31569, 31570, 31571, 31576, 31577, 31578, 31579, 31580, 31581, 31586, 32400

32401 (CONF-800380—, pp 6p, Paper 6) **Stretching the last drop of crude oil: a need for optimization of global production and consumption of oil.** Shah, D.O. 1980.

From 3. international trade exhibition and congress for oil, gas, chemical and process engineering industries; Bombay, India (16 Mar 1980).

A blueprint is offered for the optimum production and consumption of oil, including desired changes in the Government energy policy, R and D planning, management philosophy, and attitude of people towards energy and material resources. Enhanced oil recovery from reservoirs is mentioned. (DLC)

32402 (DOE/EIA—0102/49) **Base case projections of petroleum supply/demand through the first quarter of 1980.** Dwyer, C.; Kilgore, W.C.; Morlan, T.H.; Nelson, E.L. (Department of Energy, Washington, DC (USA). Energy Information Administration). Mar 1979. 30p. NTIS, PC A03/MF A01.

This memorandum was prepared to provide quarterly breakdowns of petroleum supply and demand projections issued previously for the full year 1979. The purposes of the study and analysis are: (1) to provide low and high short-term projections reflecting expectations prior to the curtailment of Iranian oil exports, (2) to estimate the extent and the impacts of the Iranian cutback with emphasis on the effects on the United States, and, (3) to collect very recent information on the US petroleum situation during the shortage and analyze impending problems as the shortage continues.

32403 (DOE/EIA—0103/22) **Alaskan hydrocarbon supply model: methodology description.** (Department of Energy, Washington, DC (USA). Energy Information Administration). Jan 1979. 77p. NTIS, PC A05/MF A01.

The Alaskan Hydrocarbon Supply Model is a computer-based forecasting model which makes mid-term projections of Alaskan production of crude oil, natural gas and natural gas liquids. It also addresses questions concerning the effect on supply of resource availability, the construction of new pipelines, and governmental policies on leasing. The model uses different price levels to generate a set of supply curves for both onshore and offshore production. These curves cover 40 to 50 supply regions. The forecasting time horizon is 40 years in five-year increments. The modeling approach relies upon two major submodels. A resource submodel establishes a set of production possibilities. An integrating submodel then uses economic factors to decide which resources to develop and which pipeline links to build or expand at any given time. This submodel employs mixed-integer linear programming to project actual production and pipeline construction as a matter of cost minimization. The model's data base includes an extensive description of the geology for different supply regions. This includes the number of structures per region; distributions describing structure depth, structure size, and sedimentation for offshore areas; the physical characteristics of possible pipeline routes; and the volume of proved reserves. Also part of the data base are pipeline capacities and the costs to construct different pipeline links. Sources for the data are the US Geological Survey, State of Alaska energy reports, and engineering and cost estimates developed by consultants. The Alaskan Hydrocarbon Supply Model is part of the Mid-Term Energy Forecasting System (MEFS). Its output becomes part of the data base for the Mid-Term Energy Market Model (MEMM).

NATURAL GAS

REFER ALSO TO CITATION(S) 31557, 31577, 31586, 31589, 31608, 32400, 32403

OIL SHALES AND TAR SANDS

REFER ALSO TO CITATION(S) 31618

HYDROGEN AND SYNTHETIC FUELS

REFER ALSO TO CITATION(S) 31492, 31731

ELECTRIC POWER

REFER ALSO TO CITATION(S) 31452, 31739, 31767, 31768, 32195, 32207, 32393, 32394, 32399, 32400, 32416, 32437

32404 (DOE/RG/04134—T1) **California Marginal-Cost-Pricing Project.** (California Energy Commission, Sacramento (USA)). Sep 1979. Contract FB01-77RG04134. 133p. NTIS, PC A07/MF A01.

This report provides a detailed analysis of methods to quantify the marginal costs of electricity supply. The nine-point criteria used include measurement of marginal costs that are consistent with economic theory, and determination of the applicability of the method and results in regulatory proceedings. The report examines methods which cover a wide range of potential cost-measurement techniques, including linear-programming models of utility systems, production functions, and simple models based on identification of marginal units. These methods were generally found to be unacceptable because they do not calculate marginal costs of a specified demand increment, and do not adequately reflect the utility's planning process. Furthur research is described that will attempt to develop more-acceptable marginal-cost estimates in rate proceedings. 29 references, 21 figures, 28 tables.

32405 (EPRI-EL—1198(Vol.1)) **Research into load forecasting and distribution planning. Final report.** Northcote-Green, J.E.D.; Cummings, A.B.; Wall, D.L.;Wilreker, V.F. (Westinghouse Electric Corp., Pittsburgh, PA (USA). Advanced Energy Systems Div.; Salt River Project, Phoenix, AZ (USA)). Aug 1980. 60p. NTIS, PC A04/MF A01.

The overall objectives of this research project are to: (1) investigate methods for improvement of the forecasting of distribution loads for short- and long-range planning, and (2) develop a model to facilitate the analysis of alternatives in short- and long-range distribution-planning studies. These research objectives were accomplished through a two-phase project. Phase one investigated small-area load-forecasting/methods and data requirements, and resulted in two forecasting/computer programs; TREND and MULTIVARIATE. Both porgrams were extensively tested at the Salt River Project and Pacific Gas and Electric Company. Phase two investigated the structure of a planning model that could use optimization techniques, and resulted in a modular computer program, the Unified Distribution Planning Model, which received extensive testing on the Salt River System. In accomplishing the project objectives, certain program limitations and research to improve the results were determined. The most-significant addition to this work would be the development of a program (Urban Model) for the forecasting of future control variables for MULTIVARIATE. In the distribution modeling phase, improvements to the optimization algorithms and to the user orientation of the UDPM would be invaluable. This volume highlights the major developments and philosophies of the project, which are explained in great depth in the succeeding two volumes. Documentation of all the computer programs is under separate cover.

32406 (EPRI-EM—1423) **Evaluation of load-management systems and devices: technical planning study TPS 78-807. Final report, June 1980.** (EUS, Inc., Pittsburgh, PA (USA)). 1980. Contract W-7405-ENG-26. 195p. NTIS, PC A09/MF A01.

This report presents the results of a first-order evaluation of those Communication and Load Control (C and LC) and Thermal-Energy-Storage (TES) systems which have been used sufficiently to provide the minimal cost and performance data required for such a first-order evaluation. A total of five generic types of remote C and LC systems, 3 types of local control devices and 8 types of thermal storage systems are examined. A costing analysis is developed for each system or device preceded by a discussion of its technical and operational characteristics. Payback figures are derived for the thermal-storage systems based on uniform operational scenarios under two basic rate structures. The report includes preliminary conclusions as to the present and future feasibility of the various systems and recommendations for further research and development that would improve the feasibility of C and LC or TES.

32407 (P—102-79-015) **Assessment of electric-utility supply plans, 1978-2000.** Simon, G.; Hargan, G.; Patel, V.; Wong, E. (California Energy Commission, Sacramento (USA)). Nov 1979. 233p. California Energy Commission, Sacramento.

The Warren-Alquist Act requires the electric utilities to submit 20-year load forecast and resource plans every two years. The law requires the Commission to evaluate the probable service area and statewide, environmental, and economic impact and the health and safety aspect of constructing and operating the facilities proposed. In addition, the Commission must evaluate reasonable alternative technologies to those proposed facilities. This report presents the staff's analysis of the feasibility and implications of supply plans formulated by the state's electric utilities to meet their forecasted electricity demand. It presents a summary of the utilities' supply plans, the factors by which the utilities' supply plans are evaluated, staff's conclusions on a statewide basis with some utility-specific recommendations, and lastly, a utility-by-utility detailed analysis. It also forms the basic critique of the utilities' resource plans and establishes the foundation for examination of alternatives. These alternatives are evaluated in a separate report, Energy Futures for California: Two Scenarios, 1978-2000. The analysis of the utilities' load forecasts is also contained in a separate document entitled California Energy Demand, 1978-2000: A Preliminary Assessment published in August 1979. 16 figures, 65 tables.

32408 (P—102-80-005) **Assessment of electric-utility supply plans, 1978-2000.** (California Energy Commission, Sacramento (USA)). Jan 1980. 259p. California Energy Commission, Sacramento.

An assessment of the utilities' forecasts of future electricity supply is presented. An analysis of the demand forecast is contained in a separate document. California Energy Demand 1978 to 2000: A preliminary Assessment (August 1979). An evaluation of the feasibility and implications of supply plans, formulated by the State's electric utilities, to meet their forecasted demand is presented. The report is a critique of the supply plans; therefore, it establishes the foundation for the examining alternatives. Utility resource plans and underlying supply planning assumptions were submitted between March and June 1978 for evaluation, but updated resource plans of July 1979 were used as the basis for the assessment. Supply plans were evaluated from utilities (PG and E, SCE, SDG and E, LADWP, Sacramento Municipal Utility District); cities (Burbank, Anaheim, Glendale, Pasadena, Riverside); Northern California Power Agency; Modesto Irrigation District; Turlock Irrigation District; Imperial Irrigation District; and Department of Water Resources.

32409 (P—300-79-005) **Summary of major electric utilities revised demand forecasts and resource plans.** Hargan, G.; Patel, V.; Morse, D. (California Energy Commission, Sacramento (USA)). Aug 1979. 24p. California Energy Commission, Sacramento.

This summary compares revised data with corresponding data submitted in 1978 under the Common Forecasting Methodology-II (CEM-II) by four California utilities - Southern California Edison; Los Angeles Department of Water and Power San Diego Gas and Electric; and Pacific Gas and Electric. Table 1 is a statewide summary of the updated forecasted peak demand compared to the CEM II forecast for the four utilities. Also shown on Table 1 is a statewide summary of the installed capacity of the existing system plus all planned capacity additions for the period 1979 through 1991 for both CFM II and the revised resource plans. The corresponding data for each individual utility is shown in Tables 2 through 5. Each utility forecasted a lower peak demand compared to its previous CEM II forecast.

32410 (P—300-80-023) **Synopsis of the energy-demand forecasting/peer-review workshop.** Jaske, M.R. (California Energy Commission, Sacramento (USA)). Jun 1980. 10p. (CONF-800249—(Absts.)). California Energy Commission, Sacramento.

From Energy demand forecasting peer review workshop; Sacramento, CA, USA (28 Feb 1980).

The synopsis reviews the workshop proceedings and the conclusions drawn from the February 1980 workshop to examine the electricity demand forecasts of Pacific Gas and Electric, Southern California Edison Company (SCE), and the California State Energy Commission. Two major areas of consensus were apparent from extended discussion by all parties present. First, the CEC end-use forecasting model was significantly superior to the macro-econometric approach for long-term base-load power-plant siting, and second, all participants asked for better documentation of the CEC model.

32411 (P—500-80-007) **Testimony on Bonneville Power Administration rates and policy: November 1978, May and August 1979.** (California Energy Commission, Sacramento (USA)). 1980. 107p. California Energy Commission, Sacramento.

This publication includes four petitions of the California Energy Commission Chairman and staff opposing Bonneville Power Administration (BPA) discriminatory rate increases on surplus Federal hydroelectric energy sold to California utilities. Effective December 21, 1979 BPA increased these rates by 400% from 3 mills (tenths of a cent) per kWh to 15 mills, based upon half the estimated cost of oil generation of California utilities. This rate increase will cost California consumers over $160 million per year at 1979 oil prices, escalating as oil prices rise in the future. All other BPA rates, including those to the aluminum industry (consuming over one-quarter of BPA's power), will remain cost-based at the lowest rates in the United States. Northwest and aluminum company rates will rise by only about 80% because revenues from California will be used to reduce them below cost, according to one of the petitions. Additional transmission interties are required between the Pacific

Northwest and Southwest (California, Nevada, and Arizona) to utilize fully the surplus Federal hydroelectric energy and summer peaking capacity. The new discriminatory rates and BPA policy vitiate against the early construction of these vital oil-saving interties.

32412 (PCTR—93-80) **Stochastic optimal energy dispatch.** Viviani, G.L. (Purdue Electric Power Center, Lafayette, IN (USA); Purdue Univ., Lafayette, IN (USA). School of Electrical Engineering). May 1980. Contract AS02-77ET29102. 256p. (TR-EE—80-17). NTIS, PC A12/MF A01.

Thesis.

A method to incorporate the effects of uncertain parameters into optimal energy dispatch of electric power systems is presented. An efficient algorithm is presented, which is a direct extension of existing methods of analysis. The method employs an initial operating point by a second order optimization procedure. Effects of uncertainty on the optimum solution are modeled by a first order linearization. The statistics of the changes in the control vector are calculated and utilized in a Gram-Charlier series type A representation of the p.d.f. of the changes of the control vector. Various properties of the Gram-Charlier series type A are studied and a transformation is developed which improves the accuracy of the truncated Gram-Charlier series. Hence, the GCA series capabilities as a model for general p.d.f.'s is enhanced. Desired probabilities of events are calculated by direct application of the truncated GCA. An example demonstrates the suitability of this method for application to actual power systems.

32413 (PCTR—94-80) **Forecasting one-step-ahead higher order statistical moments and probability density functions for power system loads using least square estimators.** Khotanzad, A. (Purdue Electric Power Center, Lafayette, IN (USA); Purdue Univ., Lafayette, IN (USA). School of Electrical Engineering). May 1980. Contract AS02-77ET29102. 145p. (TR-EE—80-19). NTIS, PC A07/MF A01.

Thesis.

Conventional load forecasting involves the prediction of the expected value of the demand of an electric power system. The expected value of a quantity which is subject to uncertainty does not fully characterize that quantity. In this thesis the one-step-ahead load value is calculated using a least square estimator which relies on previous load measurements. Subsequently, the load values are treated as an ensemble of random variables with calculable statistical moments. Calculating these moments will enable one to predict the entire one-step-ahead probability density function of the load using Gram-Charlier series Type A. From this density function, a wide variety of statistical quantities may be calculated: the mean value, the probability that the load will exceed some threshold, conditional probabilities (under special conditions such as negative generation margin), and conditional expectations.

ELECTRIC POWER GENERATION

REFER ALSO TO CITATION(S) 31738, 31740, 31741, 31742, 31743, 31744, 31745, 31746, 31747, 31748, 31749, 31750, 31751, 31752, 31753, 31754, 31755, 31756, 31757, 31758, 31759, 31760, 31761, 31762, 31763, 31764, 31765, 31766, 31769, 31770, 32188

ELECTRIC POWER TRANSMISSION AND DISTRIBUTION

32414 **Two-way data communication between utility and customer.** Lihach, N.; Blair, W. *EPRI J.*; 5: No. 4, 16-19(May 1980).

Distribution automation is the remote control of the distribution network that carries power from local substations to customer meters. The system, which seems to be feasible for the near future, provides two-way communication between utility and customer; not only must the utility operator be able to issue commands to automated equipment but the customer's meter must be able to answer the controller, reporting status and relaying data. Although there are other available, three types of communication systems are being investigated at present as the most feasible: power line carrier, telephone, and radio. Each system has its own special capabilities and limitations. Hybrid systems (two or more different communication systems) are also a possibility. Besides fault location and service restoration, distribution automation could facilitate time-of-day metering, load control, voltage control, and even meter reading. Most aspects of this two-way communication are accepted as beneficial by the customer; load control, however, which could selectively interfere with major appliances like water heaters, air conditioners, etc., during peak demand by selectively switching them off to level peak loads, might not be so readily acceptable. (SAC)

CONSUMPTION AND UTILIZATION

REFER ALSO TO CITATION(S) 32370, 32377, 32396, 32434, 32435, 32438, 32443, 32444, 32461, 32464, 32476, 32481, 32486

32415 (UCID—18760) **California energy flow in 1978.** Briggs, C.; Borg, I.Y. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Aug 1980. Contract W-7405-ENG-48. 20p. NTIS, PC A02/MF A01.

In 1978 California's total energy use was very close to that of 1977. All forms of transportation consumed 40% of all energy used as contrasted to 26% for the nation as a whole for the same year. Compared to 1977, California's use of hydroelectric power increased three-fold as the direct result of the end of the 1976 to 1977 drought. Oil, gas, and electricity usage changed by small measure, +1.6%, -5.8% and +3.6%, respectively. Oil and gas freed by the increased hydroelectric potential was used by other end-use sectors in the state with transportation taking the largest share. Consumption in that sector increased by approximately 11%. A conspicuous change in 1978 was the new mix of crude oil sources. Domestic California production was essentially stable at 19% of the total; foreign imports chiefly from Indonesia fell 50%; interstate shipments chiefly from Alaskan North Slope more than doubled. Natural gas supply sources and uses were similar to those of 1977. Industrial use of natural gas appears to have fallen. There is some indication of fuel switching to fuel oils, relocation of industry to other states and conservation in response to escalated fuel prices. Coal continues to be an insignificant fuel in California. Geothermal contributed less than 2% to total transmitted electricity. The comparable figure for nuclear energy is 4% and for imported power from other states, 20%.

UNCONVENTIONAL SOURCES AND POWER GENERATION

REFER ALSO TO CITATION(S) 32395

32416 (P—500-80-008) **Exploring new choices for California: the 1980/81 Report to the Legislature.** (California Energy Commission, Sacramento (USA)). Feb 1980. 112p. California Energy Commission, Sacramento, CA.

The major portion of the California Energy Commission's energy commercialization activities is contained in two programs, the Energy Development Program and the Regulatory and Planning Program. The Energy Development Program accelerates the use of alternative energy resources and technologies which are available for near-term application in California. A variety of mature and economically viable resources indigenous to the state, such as geothermal steam and hot water, agricultural and forestry residues (biomass), solar energy, and hydroelectric resources are being pursued. Advanced energy technologies and technologies not yet proven economically, such as large-scale wind electric conversion technologies, solar electric applications, and geothermal binary conversion systems are being evaluated. The Commission's program is designed to complement the R and D and commercialization activities of the Federal government, California utilities, private industry, and other outside groups by concentrating on areas of significant statewide interest that are not adequately covered by these other organizations. The Commission's Regulatory and Planning Program is responsible for the certification of proposed power-plant sites and related facilities in the state. The program is intended to assess the need for, desirability, and acceptability of new energy-facility sites. The program evaluates generation and nongeneration technologies and analyzes options for resolving fuel and energy problems in order to present recommendations for action.

SOLAR

REFER ALSO TO CITATION(S) 31778, 31785, 31787, 31793, 31871, 31876, 31988, 32037, 32038, 32460, 32759

GEOTHERMAL

REFER ALSO TO CITATION(S) 32065, 32066, 32067, 32068, 32069, 32070, 32071, 32072, 32073, 32074, 32075, 32104, 32109

32417 (P—800-79-004) **Geothermal Advisory Committee to California State Enery Resources Development and Conservation Commission. Final report.** (California Energy Commission, Sacramento (USA)). Jan 1979. 69p. California Energy Commission, Sacramento.

The substance of the open public meeting held by the Geothermal Advisory Committee between April 1978 and January 1, 1979 to discuss California's developing geothermal resources and the Committee recommendations which grew out of them are reported. (MHR)

OTHER

REFER ALSO TO CITATION(S) 31717, 31838, 31840, 31841, 31842, 31849, 32164, 32400, 32469, 32493

32418 (NCEI—0015) **Future of alcohol fuels.** (North Carolina Energy Inst., Research Triangle Park (USA)). 25 Apr 1980. 27p. NTIS.

Synthetic fuels will soon be produced from coal in the US to replace imported petroleum. Methanol from coal is probably the least expensive synthetic liquid and is also a good motor fuel, both as a 10% mixture in gasoline and straight. The current interest in ethanol and gasohol supports a logical first step in a planned program for methanol to replace gasoline in spark plug engines in the US. The path which is outlined in this paper would probably require twenty-five years to complete. A national decision to follow this path could greatly strengthen the current US position in dealing with OPEC nations. North Carolina as well as other states could play a useful role in initiating such an effort.

32419 **Sugar crops for fuel alcohol.** Irvine, J.E. Houma, LA; Sugarcane Field Laboratory (1980). 4p. (CONF-800526—2).

From Alcohol alternative conference; Chicago, IL, USA (1 May 1980).

The use of alcohol rather than petroleum as a fuel source would require a large amount of land and suitable crops. Acerage now in use for food crops and animal production in the USA is given. The author presents alternatives to present land use in order to free acreage for energy crops such as sorghum, sugar beets, and sugar cane. (DC)

ENERGY CONVERSION

MHD GENERATORS

DESIGN AND DEVELOPMENT

32420 (DOE/ET/15518—1) **Key contributions in MHD power generation. Semi-annual report, December 1, 1978-May 31, 1979.** Louis, J.F. (Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.). Jun 1979. Contract AC01-79ET15518. 367p. NTIS, PC A16/MF A01.

Research and development on open-cycle coal-fired MHD generators at MIT is reported. Separate abstracts were prepared for progress reported on the four tasks. (WHK)

MATERIALS, COMPONENTS, AND AUXILIARIES

REFER ALSO TO CITATION(S) 32420

32421 (DOE/ET/10815—T1) **Interelectrode insulator development for the UTSI MHD generator. Topical report.** White, M.K. (Tennessee Univ., Tullahoma (USA). Space Inst.). Oct 1979. Contract AC02-79ET10815. 37p. NTIS, PC A03/MF A01.

For successful operation of an MHD generator, the electrodes must be separated by a dielectric material capable of withstanding temperatures of several hundred degrees (centigrade) as well as erosion, chemical attack and penetration by slag and seed compounds. The insulators must also either seal the interelectrode gap from gas leaks to the channel exterior, or be used in conjunction with a gasket. The UTSI approach has been to use commercially available insulating materials that are easily workable, such as ceramic felts and textiles with appropriate treatments to enhance thermal conductivity and reduce moisture absorption and gas permeability. In two series of tests on numerous insulator systems under actual MHD run conditions, the best results have been shown by a woven leached silica cloth (Refrasil) coated with a commercial boron nitride slurry. Insulators made of solid plate boron nitride and also of boron nitride strips backed up with a gasketing material have also given promising performance. Results are presented and discussed.

32422 (DOE/ET/15518—1, pp 229-324) **Electrode module development and testing.** Jun 1979.

In Key contributions in MHD power generation. Semi-annual report, December 1, 1978-May 31, 1979.

The ternary systems $SrZrO_3$-$LaFeO_3$-SrFeO/sub 3-δ/ and $SrZrO_3$-$LaFe_{0.5}Cr_{0.5}O_3$-$SrFe_{0.5}Cr_{0.5}$O/sub 3-δ/ were investigated as possible electrode materials for coal-fired MHD generators. Phase diagrams were completed and electrical conductivity and Seebeck voltage measurements were made over a wide range of oxygen partial pressures. Some dielectric breakdown measurements have been made at room temperature and elevated temperature for four materials. Work has begun toward setting up a clean fired burner and associated equipment to test insulators with an imposed thermal gradient. Progress on the design and construction of the MIT MHD Simulation Facility is reported. (WHK)

32423 (DOE/ET/15518—1, pp 325-355) **Coal combustion studies.** Jun 1979.

In Key contributions in MHD power generation. Semi-annual report, December 1, 1978-May 31, 1979.

Progress on the kinetic modelling of the 2-stage combustor for a coal-fired MHD generator is reported. The three subtasks involve pyrolysis, ash vaporization, and model development. In the pyrolysis experiments, the major effort has been expended on modifying the sample collection equipment in order to permit separation of soot from char in the pyrolysis experiments. The probe development has been completed approximately two months behind schedule. Pyrolysis experiments with the new probe are to be initiated during the next quarter. Ash vaporization kinetics have been determined over a temperature range of 2000 to 3000°K in collaboration with a parallel program on an EPRI project. The data on ash vaporization kinetics and literature data on the Co_2-C, H_2O-C, OH-C, and O-C have been used to refine the char combustion equations and to include ash vaporization in the system model.

DUCT ENGINEERING AND FLUID DYNAMICS

REFER ALSO TO CITATION(S) 32420

32424 (ANL/MHD—80-4) **US U-25 channel performance analysis.** Doss, E.; Pan, Y.C. (Argonne National Lab., IL (USA)). Jul 1980. Contract W-31-109-ENG-38. 103p. NTIS, PC A06/MF A01.

The results of an ANL computational analysis of the performance of the US U-25 MHD channel are presented. This channel has gone through several revisions. The major revision occurred after it had been decided by the DOE Office of MHD to operate the channel with platinum-clad copper electrodes (cold), rather than with ceramic electrodes (hot), as originally planned. This work has been performed at the request of the DOE Office of MHD and the US U-25 generator design Review Committee. The channel specifications and operating conditions are presented. The combustor temperature and thermodynamic and electrical properties of the plasma are computed, and the results are discussed. The MHD channel performance has been predicted for different operating conditions. Sensitivity studies have also been performed on the effects of mass flow rate, surface roughness, combustor temperatures, and loading on the channel performance.

32425 (DOE/ET/15518—1, pp 14-124) **Arcing phenomena in MHD generators.** Jun 1979.

In Key contributions in MHD power generation. Semi-annual report, December 1, 1978-May 31, 1979.

The principal experimental results obtained relate to the mechanisms of current transport to clean (non-slagged) electrodes. Voltage drops on anode and cathode walls were measured at average current densities as high as 2.5 A/cm^2 at plasma and electrode wall conditions smilar to those of a commercial scale MHD generator. Visual observation of the stainless steel electrode surface indicated the absence of transverse arcs on anodes for all conditions and showed cathode arc spots for all but the lowest currents. Measured anode voltage drops were compared with values predicted by a boundary layer code. In addition to solving the continuity, momentum and energy equations for the heavy gas, the program solves the continuity equation for the electrons, including the effects of electron-ion kinetics. Electron temperature elevation was estimated, but not included in the detailed calculation. Results of these comparisons are presented in the progress report and provide a guide for the continued efforts in this subtask. Preparations for a second experiment have progressed significantly. Slagged-wall related work has progressed in to areas: (a) the slag polarization effects; and (b) the structure and effects of ripples on slag flow. A literature survey has been conducted, on the conduction mechanisms through molten slag, and the effects associated with it. A discussion is included of the likely prevailing mechanisms, and a simplified electron-hole-positive ions-negative ions model is described which shows the effect of oxygen potential on these mechanisms. Experiments have been initiated, with only low-temperature, solid state results obtained so far.

32426 (DOE/ET/15518—1, pp 125-228) **Open cycle disk generator program.** Jun 1979.

In Key contributions in MHD power generation. Semi-annual report, December 1, 1978-May 31, 1979.

The potential benefits of the disk generator with swirl (as an alternative to a linear generator) are discussed, and earlier/previous results are reviewed. Critical performance factors/issues are defined, and the MIT disk program goals which addresses these issues are outlined. In particular, the effective plasma properties and generator performance (with and without swirl) as affected by: (a) plasma nonuniformities; (b) electric stress limitations; (c) chemical nonequilibrium (in small-scale supersonic generators); (d) unsteady flow phenomena; (4) boundary layers (and inlet boundary layer separation)

and slag; and (f) inviscid flow distortion are to be investigated. Theoretical modeling and the development of diagnostics are designed to support the experimental work; a detailed data base is to be developed which can be applied to the design and performance predictions of large-scale disk generators. Major efforts have been directed primarily in three areas: (a) nonuniformities studies in a radial flow disk; (b) instrumentation and diagnostics development; and (c) two-dimensional modeling of disk channels. The results are detailed.

PERFORMANCE AND TESTING

REFER ALSO TO CITATION(S) 31726

MATERIALS, COMPONENTS, AND AUXILIARIES

REFER ALSO TO CITATION(S) 31723, 32479

APPLICATIONS

REFER ALSO TO CITATION(S) 32187

FUEL CELLS

DESIGN AND DEVELOPMENT

32427 (DOE/ET/12431—T1(Vol.2)) **Feasibility study: fuel cell cogeneration in a water pollution control facility. Final report.** (Gilbert/Commonwealth, Reading, PA (USA)). Feb 1980. Contract AC03-78ET12431. 164p. NTIS, PC A08/MF A01.

A conceptual design study was conducted to investigate the technical and economic feasibility of a cogeneration fuel cell power plant operating in a large water pollution control facility. The fuel cell power plant would use methane-rich digester gas from the water pollution control facility as a fuel feedstock to provide electrical and thermal energy. Several design configurations were evaluated. These configurations were comprised of combinations of options for locating the fuel cell power plant at the site, electrically connecting it with the water pollution control facility, using the rejected power plant heat, supplying fuel to the power plant, and for ownership and operation. A configuration was selected which met institutional/regulatory constraints and provided a net cost savings to the industry and the electric utility. This volume of the report contains the appendices: (A) abbreviations and definitions, glossary; (B) 4.5 MWe utility demonstrator power plant study information; (C) rejected heat utilization; (D) availability; (E) conceptual design specifications; (F) details of the economic analysis; (G) detailed description of the selected configuration; and (H) fuel cell power plant penetration analysis. (WHK)

32428 (DOE/ET/12445—T1) **Relation between component technical parameters and fuel cell power plant characteristics. Final technical report.** Levy, A.; Dine, L.V. (United Technologies Corp., South Windsor, CT (USA). Power Systems Div.). 1979. Contract AC03-78ET12445. 76p. NTIS, PC A05/MF A01.

The purpose of this study is to determine the impact of applied technology improvements on fuel cell power plant operational and cost characteristics. The results of this evaluation are intended to identify to DOE those areas which will provide the most significant payoff for long range research and development activities. The study is focused on the phosphoric acid fuel cell and investigates both small multi-kilowatt on-site power plants as well as large multi-megawatt systems intended for dispersed utility application. In addition, since complete power plants are considered, the potential improvements in major ancillary subsystems, such as fuel processing and power conditioning, are evaluated in terms of their impact on the entire system and its potential for meeting the requirements of various applications are presented and discussed. (WHK)

32429 (DOE/NASA/1002—80-5) **Redox storage systems for solar applications.** Hagedorn, N.H.; Thaller, L.H. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). 1980. Contract AI01-76CS21002. 30p. (NASA-TM—81464; CONF-800917—1). NTIS, PC A03/MF A01.

From 12. power sources conference; Brighton, UK (15 Sep 1980).

The world-wide development of solar photovoltaic and wind turbine systems to meet a range of terrestrial electrical energy requirements has underscored the need for inexpensive and reliable electrical energy storage. The NASA Redox Energy Storage System based on soluble aqueous iron and chromium chloride redox couples has displayed many system-related features which for the most part are unique to this storage system. The needed technology advances in the two elements (electrodes and membranes) that are the key to its technological feasibility have been achieved and system development has begun. The design, construction, and test of a one-kilowatt system integrated with a solar photovoltaic array is underway to provide early demonstration of the attractive system-related features of the NASA Redox Storage system, its versatility and its compatibility with a terrestrial solar photovoltaic electric power system.

32430 (SRD—80-055) **Development of molten carbonate fuel cells for power generation. Final report, August 1977-December 1979.** (General Electric Co., Schenectady, NY (USA). Corporate Research and Development Dept.). Apr 1980. Contract AC03-77ET11319. 549p. NTIS, PC A23/MF A01.

This report presents the results of molten carbonate fuel cell research and development at the General Electric Company during the period between August 1977 and December 1979. The objectives of this Phase I effort included the development of promising concepts to circumvent a number of outstanding technical challenges in molten carbonate fuel cell technology, and the better definition of the operating limits of molten carbonate fuel cells and power plant based thereupon. A major focus was the development of cell technology which would be compatible with high-efficiency, large-scale, coal-fired fuel cell power plants. The broad and comprehensive program included elements of system definition, cell and system modelling, cell component development, cell testing in pure and contaminated environments, and the first stages of technology scale-up. Single cells, with active areas of 45cm^2 and 582cm^2, were operated at 650°C and 1 atm pressure using low-Btu simulated coal-derived fuels. Cell performance was improved to state-of-the-art levels through the development of new cell design concepts and improved electrolyte and electrode components. Performance was shown to degrade by the presence of fuel contaminants, such as sulfur and chlorine, and due to changes in electrode structure. Using conventional hot-press fabrication techniques, electrolyte structures up to 20" x 20" were fabricated. Promising new approaches were developed for non-hot-pressed electrolyte structure fabrication and a promising new electrolyte matrix material was identified. This program formed the basis for a long-range effort to realize the benefits of molten carbonate fuel cell power plants.

MATERIALS, COMPONENTS, AND AUXILIARIES

REFER ALSO TO CITATION(S) 31470, 32430

APPLICATIONS

REFER ALSO TO CITATION(S) 32187

32431 (BNL—28094) **Improved alkaline hydrogen/air fuel cells for transportation applications.** McBreen, J.; Kissel, G.; Kordesch, K.V.; Kulesa, F.; Taylor, E.J.; Gannon, E.; Srinivasan, S. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 6p. (CONF-800806—32). NTIS, PC A02/MF A01.

From 15. intersociety energy conversion engineering conference; Seattle, WA, USA (18 Aug 1980).

Considerable progress has been made in the last few years on improvement of alkaline air electrodes for air depolarized chlor-alkali cells. Some of these electrodes from Union Carbide Corporation have been evaluated at Brookhaven National Laboratory in alkaline hydrogen/air fuel cells. In initial tests with 289 cm^2 electrodes, power densities of 100 mW/cm^2 were obtained at 0.65 V. This compares with power densities of 27 mW/cm^2 obtained by Kordesch in his vehicle fuel cell in the late sixties. Further improvements in the air electrode flow field yielded power densities of 126 mW/cm^2 at 0.65 V at an operating temperature of 70°C. At 30°C, nearly 60% of this power could be obtained at 0.65 V. The 289 cm^2 cells were units in a 16-cell 0.5 kW module. This module yielded similar power densities, and its power/weight and power/volume are sufficiently attractive for it to be considered as a building block for a fuel cell power plant in a fuel cell/battery hybrid vehicle.

ELECTROMECHANICAL CONVERTERS

32432 (DOE/ER/04679—3) **Ferroelectric ceramics for dielectric power conversion. Annual report, March 1, 1979-April 30, 1980.** Payne, D.A. (Illinois Univ., Urbana (USA). Dept. of Ceramic Engineering). May 1980. Contract AS02-78ER04679. 46p. NTIS, PC A03/MF A01.

Materials selected for study were those which could be expected to have useful Curie temperatures, resistivities, coercive fields, and Devonshire coefficients. Materials studied include PZT (lead-zirconia-titania system), $Bi(Na,K)Ti_3O_8$, rare earth titanoniobates, other tantalates and niobates, and thin films. Graphs are given for spontaneous polarization as a function of composition, temperature dependence of spontaneous polarization and coercive field for modified PSZT dielectrics, temperature dependence of electric resistivity for modified PSZT dielectrics, and x-ray diffraction data. Materials forming and processing techniques are briefly described. (WHK)

ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

32433 (DOE/CS—0159/2) **State Energy Conservation Program Measure Directory. Sourcebook: Volume 8. Part 2 of 2 books.** (Department of Energy, Washington, DC (USA). Office of State and Local Programs). May 1980. 596p. NTIS, PC A25/MF A01.

DOE prepared an 8-volume Sourcebook to provide useful information for states in development and implementation of their Energy Conservation Plans. The purpose of Vol. 8, a 2-book set, is to facilitate exchange of information among states concerning program measures of common interest. DOE/CS—0159/1, Vol. 8, Book 1, announced in EAPA 6: abst. 3475, covered states Alabama through Missouri; this report, Vol. 8, Book 2 begins with Montana and completes the alphabet. Information is summarized also for American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and the Virgin Islands in the two books. Information on the various programs in each state includes identification data; narrative description of program measure; program measure information; and annual energy savings reported. A cross-reference index is included for agriculture, industry, transportation, buildings, government, legislative/regulatory implementation strategies, general education implementation strategies, specific information implementation strategies, demonstration implementation strategies, administration implementation strategies, and renewable-resource implementation strategies.

BUILDINGS

REFER ALSO TO CITATION(S) 32003, 32500, 32507, 32508, 32509, 32510

32434 (COO—1340-69) **Effects of atmospheric variability on energy utilization and conservation. Final report, 1 January 1979-31 December 1979.** Reiter, E.R.; Burns, C.C.; Cochrane, H.; Johnson, G.R.; Leong, H.; McKean, J.; Sheaffer, J.D.; Starr, A.M.; Webber, J. (Colorado State Univ., Fort Collins (USA). Dept. of Atmospheric Science). Apr 1980. Contract AS02-76EV01340. 113p. NTIS, PC A06/MF A01.

An interdisciplinary approach towards a detailed assessment of energy consumption in urban space-heating and cooling is presented in terms of measurement and modeling results. Modeling efforts concentrated on the city of Minneapolis, MN, using data from the winter seasons 1977/78 and 1978/79. Further developments of a reference model also fall back on data from Cheyenne, WY, and Greeley, CO. Mean absolute daily errors of gas consumption estimated by the physical model applied to Minneapolis are 6.26% when compared to actual energy usage for the period 12/1/77 to 2/28/78. The mean daily absolute errors for the statistical reference model for the same time period were 5.54%. Modeling of the energy consumption required detailed input of meteorological parameters from a special network of stations. As a spin-off an assessment was obtained of the effects of anthropogenic heat on urban heat-island generation under various synoptic conditions. A detailed building census, comprised of 105.722 heated structures, was obtained. A field survey in Greeley indicated that investment returns from insulating houses might not be as high as hoped for; possibly a considerable amount of insulating material is applied wastefully. Misinformation seems to be the primary cause of misguided energy conservation. Progress in conservation could be achieved if utility costs were considered in mortgage-loan applications, together with principal, interests, taxes, and insurance. Detailed energy-consumption modeling would be a premise for such fiscal-management approaches. Another extensive field survey yielded data for a local input-output model applied to the city of Greeley. Economic multipliers for dollars of output, space heating, energy use, and employment were developed and used for growth projections to the year 2003 under varying scenarios.

32435 (DOE/CS/20220—1) **Handbook of energy use for building construction.** Stein, R.G.; Stein, C.; Buckley, M.; Green, M. (Stein (Richard G.) and Partners, New York (USA)). Mar 1980. Contract AC02-79CS20220. 211p. NTIS, PC A10/MF A01.

The construction industry accounts for over 11.14% of the total energy consumed in the US annually. This represents the equivalent energy value of 1 1/4 billion barrels of oil. Within the construction industry, new building construction accounts for 5.19% of national annual energy consumption. The remaining 5.95% is distributed among new nonbuilding construction (highways, railroads, dams, bridges, etc.), building maintenance construction, and nonbuilding maintenance construction. The handbook focuses on new building construction; however, some information for the other parts of the construction industry is also included. The handbook provides building designers with information to determine the energy required for buildings construction and evaluates the energy required for alternative materials, assemblies, and methods. The handbook is also applicable to large-scale planning and policy determination in that it provides the means to estimate the energy required to carry out major building programs.

32436 (DOE/EIS—0061/DS-1) **Draft environmental impact statement: supplement. Energy performance standards for new buildings.** (Department of Energy, Washington, DC (USA)). Mar 1980. 244p. NTIS, PC E05/MF $3.50.

Energy performance standards for new buildings are proposed to be implemented as mandated by Congress in Section 305 of the Energy Conservation Standards for New Buildings Act of 1976 (adopted as Title III of the Energy Conservation and Production Act Pub. L. 94-385, 42 U.S.C. 6801 et. seq.) Environmental impacts of setting the Standards were analyzed in the Draft Environmental Impact Statement, DOE/EIS-0061-D (DOE 1979a). This supplemental information to the DEIS analyses institutional, socioeconomic and physical environmental impacts of a comprehensive implementation program, which would include adopting, administering, enforcing and monitoring the effectiveness of the Standards. Impacts from four alternative implementation programs designed to bound the range of potential implementation programs have been anlyzed as well as impacts of specific components of an implementation program. The range of physical and natural environmental impacts from the four implementation alternatives is within the range of impacts estimated for the Standards.

32437 (IKE-K—60) **Applications of systems research in regional planning.** (Stuttgart Univ. (TH) (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme). Oct 1979. 280p. (In German). NTIS (US Sales Only), PC A13/MF A01.

Problems encountered in power supply planning are pointed out from the point of view of the individual consumer, the supply district of a public utilities, the lender, and the state of West Germany. Possibilities of energy conservation in civil engineering, city construction, and area planning, some of them with the aid of legal measures, are described.

32438 (LBL—8689(Rev.1)) **DOE-2 users guide: version 2.1.** (California Univ., Berkeley (USA). Lawrence Berkeley Lab.; Los Alamos Scientific Lab., NM (USA)). May 1980. Contract W-7405-ENG-36;W-7405-ENG-48. 484p. NTIS, PC A21/MF A01.

DOE-2 is a public domain computer program which can be used to explore the energy behavior of proposed and existing buildings and their associated HVAC systems. Incorporating mathematical models (called algorithms) and utilizing hourly weather data, DOE-2 calculates the hour by hour performance and response of a building whose description has been provided by the user. In addition, DOE-2 can produce an economic analysis of the energy use and the costs and benefits of making alterations in design. DOE-2 is the second in a proposed sequence of programs. Each of the algorithms of DOE-2 is being tested, and as improvements are discovered, they will be incorporated into future versions. In addition, simplifying input and output procedures have been proposed to enhance the use of the program by a wider group of people. DOE-2 is intended to be used by architects, engineers, and others who are concerned with the energy analysis of buildings and with the consequent economic implications.

32439 (LBL—8822) **New measurement strategy for in situ testing of wall thermal performance.** Condon, P.E.; Carroll, W.L.; Sonderegger, R.C. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Jun 1980. Contract W-7405-ENG-48. 42p. (CONF-791233—6; EEB-ENV—79-3). NTIS, PC A03/MF A01.

From Conference on thermal performance of the exterior envelopes of buildings; Orlando, FL, USA (3 Dec 1979).

A new device is proposed for measuring the thermal resistance and the dynamic thermal response of building walls in either the laboratory or the field. The primary departures from past approaches are the control of the time-dependent surface heat fluxes on the specimen and the determination of the surface temperatures as dependent variables. The performance characteristics of the device are analyzed by the use of complex thermal admittance. A prototype is being developed based on this analysis. The apparatus is portable and has sophisticated on-line computer control and data analysis through the use of a microprocessor.

32440 (LBL—9749) **Residential ventilation with heat recovery: improving indoor air quality and saving energy.** Roseme, G.D.; Berk, J.V.; Boegel, M.L.; Halsey, H.I.; Hollowell, C.D.; Rosenfeld, A.H.; Turiel, I. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). May 1980. Contract W-7405-ENG-48. 30p. (CONF-791233—4; EEB-Vent—80-10). NTIS, PC A03/MF A01.

From Conference on thermal performance of the exterior envelopes of buildings; Orlando, FL, USA (3 Dec 1979).

Interest in conserving energy is motivating homeowners and builders to reduce natural infiltration to very low levels. This large reduction in ventilation can lead to indoor moisture problems and, more importantly in terms of human health, increased levels of

indoor pollutants such as nitrogen dioxide, formaldehyde, and radon. This paper reports residential air-quality measurements conducted by LBL and, specifically, discusses the use of mechanical ventilation systems with air-to-air heat exchangers as a promising means of pollutant control. A particular advantage of this control strategy is that the heat exchanger permits recovery of a large portion of the heat that would normally be lost in a simple exhaust ventilation system, and therefore maintains the energy efficiency of the house. An economic analysis is presented showing that installation of these systems in newly constructed homes is cost-effective in most regions of the country.

32441 (P—400-80-001) **California Energy Commission Conservation Division Regulations for Appliance Efficiency Standards (includng requirements for intermittent ignition devices): relating to refrigerators and freezers, room air conditioners, central air conditioners, gas space heaters, water heaters, plumbing fittings, gas clothes dryers, and gas cooking appliances.** (California Energy Commission, Sacramento (USA)). Feb 1980. 37p. California Energy Commission, Sacramento.

The text of caragraphs 1601 to 1608 of Article 4: Appliance Efficient Standards of the California Administrative Code, Title 20, Chapter 2, Subchapter 4: Energy Conservation is presented. The type of new appliances for which the standards apply are identified.

32442 (P—400-80-008) **Data on lighting equipment necessary for development of efficiency standards.** (Ross and Baruzzini, Inc., St. Louis, MO (USA)). Jul 1980. 180p. California Energy Commission, Sacramento, CA.

An attempt was made to present an even and balanced evaluation of the potential for energy conservation in lighting systems, particularly with emphanalysis on existing equipment and near-future potentially available equipment. The report provides data for the lighting equipment needed to develop lighting-efficiency standards. This report contains data concerning 23 task topics including: lighting fixtures - analysis of use, luminaire efficiency, visual effectiveness, cost effectiveness, and performance specifications; commercial lamps and ballasts - basis of efficiencies, performance characteristics, cost-effectiveness reliability of manufacturers' data, and proposed action to develop standards; accessories and controls - identification and analysis of types, energy savings potential, cost effectiveness, and recommendations to develop new standards; lighting developments - developments with the promise of providing an energy-conservation breakthrough in the near future.

32443 (LA—7689-M(Ver.2.1)(Pt.2)) **DOE-2 reference manual.** (Los Alamos Scientific Lab., NM (USA); California Univ., Berkeley (USA). Lawrence Berkeley Lab.). May 1980. Contract W-7405-ENG-36;W-7405-ENG-48. 1889p. (LBL—8706(Rev.1)(Pt.2)). NTIS, PC A99/MF A01.

Two types of reports are available to DOE-2 users. Standard output reports are available for each of the four calculational programs, LOADS, SYSTEMS, PLANT, and ECONOMICS (LSPE). Hourly reports that print or plot the values of user-selected variables for particular hours of the year are available for the LOADS, SYSTEMS, and PLANT programs. Each of the LSPE programs offers its own set of standard reports. Samples of these reports appear in the respective chapters of this manual. Two types of standard reports make up each set, input-verification reports and calculation-summary reports. In Chaps. III, IV, V, and VI, information is given for each of the standard reports available for each of the LSPE programs.

32444 (LA—7689-M(Ver.2.1)(Pt.1)) **DOE-2 reference manual.** York, D.A.; Tucker, E.F. (ed.). (Los Alamos Scientific Lab., NM (USA); California Univ., Berkeley (USA). Lawrence Berkeley Lab.). May 1980. Contract W-7405-ENG-36;W-7405-ENG-48. 660p. (LBL—8706(Rev.1)(Pt.1)). NTIS, PC A99/MF A01.

A new, user-oriented language, the Building Description Language, has been written to describe a building and its operation. DOE-2 includes: a Building Description Language (BDL) program to analyze the input instructions, perform data assignments and data retrieval, and control the operation of the LOADS, SYSTEMS, PLANT, ECONOMICS, and REPORT programs; a LOADS analysis program, which calculates peak, or design, loads and hourly space loads imposed by ambient weather conditions and internal occupancy, lighting, and equipment, as well as by variations in the size, location, orientation, construction, and materials for walls, roofs, floors, fenestrations, attachments (e.g., awnings or balconies), and the shape of a building; a SYSTEMS program capable of simulating the operation of secondary HVAC components, including fans, coils, economizers, and humidifiers, which may be arranged in various user-selected configurations and may be operated according to various temperature schedules; a PLANT program, which models the operation of primary HVAC components (e.g., boilers, chillers); electric generation equipment (e.g., diesel engines or turbines), energy storage and solar heating and/or cooling systems; an ECONOMICS analysis program, which calculates life-cycle costs; a REPORT program that generates the output reports, and a set of WEATHER ANALYSIS programs capable of manipulating, summarizing, and plotting weather data. A library of weather data for 60 locations in the US; a construction library containing data on the properties of walls, roofs, and floors; and a materials library containing data on the common building materials are available in machine addressable form. The other library data are available only in printed form. Input and output samples are included to illustrate the use of DOE-2. The DOE-2 language processors, solar simulator and economics evaluation program are new.

32445 **Natural ventilation, passive cooling and human comfort in buildings: a comprehensive technical bibliography.** Vonier, F. Washington, DC; Thomas Vonier Associates, Inc. (1980). 36p. (NP—24998). $10.00.

Approximately 700 references are given in the technical bibliography on ventilating and cooling of buildings.

32446 **Directory of gas space heaters excluding central furnaces.** Sacramento, CA; California Energy Commission (1980). 35p. (NP—25019).

Gas space heaters (room heaters, floor furnaces, wall furnaces, boilers) that have been certified as complying with the regulations that became effective on December 22, 1978, are identified. Future directories will list unit heaters and duct furnaces. Standards which became effective on December 22, 1978 are listed.

32447 **Energy conservation and indoor air pollution.** Silberstein, S. (Brookhaven Natl Lab, Upton, NY). *Energy Build.;* 2: No. 3, 185-189(Aug 1979).

The paper presents a model that accounts for the reduced heating system operating requirement permitted by energy conservation by assuming that indoor pollutant levels are linear in reduced air exchange (v). This model predicts that when v is reduced 4-fold, heating system pollutant contributions can still rise up to 3-fold, depending upon building characteristics and the extent of increased insulation. 17 refs.

RESIDENTIAL BUILDINGS

REFER ALSO TO CITATION(S) 31981, 32004, 32015, 32016, 32017, 32029

32448 (CONF-800642—4) **Advanced residential furnaces.** Macriss, R.A. (Institute of Gas Technology, Chicago, IL (USA)). 1980. Contract AC01-78ET12168. 20p. NTIS, PC A02/MF A01.

From International gas research conference; Chicago, IL, USA (9 Jun 1980).

Improved combustion, flue-products-venting, and heat exchange processes utilized in the design of high-efficiency residential gas-fired central furnaces are briefly discussed. A technical summary is also presented of high efficiency residential gas-fired central furnace developments under way in the U.S. Non-condensing and condensing-flue product concepts are included with their technical status, attained or projected performance, and forward plans for commercialization. Equipment currently, or soon to be, in the market and in laboratory and field evaluations are included. A brief summary of efforts to insure introduction and to enhance timely market acceptance of such equipment is also presented.

32449 (DOE/CS/21366—01) **Low Cost/No Cost Energy Conservation Program in New England: an evaluation.** (Booz, Allen and Hamilton, Inc., Bethesda, MD (USA)). Jul 1980. Contract AM01-80CS21366. 162p. NTIS, PC A08/MF A01.

The DOE conducted the Low Cost/No Cost Program in Massachusetts, Vermont, Connecticut, Rhode Island, Maine, and New Hampshire. The purpose of the program was to motivate consumers to take the recommended low cost/no cost actions, which save energy and help control increasing energy costs. The $2.6 million program consisted of a strong multimedia marketing effort. Eleven measures dealing with installing a shower flow control device, reducing energy to heat water, insulating, caulking and insulating gaskets, and using appliances efficiently were recommended. If a typical New England household followed the 11 actions, DOE estimates up to 25% of the home energy bill could be saved.

32450 (DOE/ET/11288—T2) **Improving the efficiency, safety, and utility of woodburning units. Quarterly report No. WB-3.** Dyer, D.F.; Maxwell, T.T.; Maples, G.; Cooley, I.D.; Badr, O.A.; Stringfellow, N.J.; Barksdale, G.; Gordon, L.J. (Auburn Univ., AL (USA). Dept. of Mechanical Engineering). 15 Jun 1978. Contract AS05-77ET11288. 146p. NTIS, PC A07/MF A01.

Research completed on June 15, 1978 to improve the efficiency, safety, and utility of wood burning units is reported. Methods for the prediction of the performance of wood burning stoves are presented. The effect of wood size on efficiency, testing of model stoves, and tests on currently manufactured units are described. Progress on a practical design handbook for manufacturers of wood heating equipment is announced.

32451 (DOE/ET/11288—T3) **Improving the efficiency, safety, and utility of woodburning units. Quarterly report No. WB-7.** Maxwell, T.T.; Dyer, D.F.; Maples, G. (Auburn Univ., AL (USA). Dept. of Mechanical Engineering). 15 Jun 1979. Contract AS05-77-ET11288. 49p. NTIS, PC A03/MF A01.

Work completed to June 15, 1979 to improve the efficiency, safety, and utility of wood heating units is reported. Work has continued on all phases of the project. In particular, the studies on creosote formation have produced more results. Tests have been conducted to reduce the infiltration of room air into fireplaces. A preliminary infrared photographic study has been carried out with a wood stove and a fireplace. Tests have been set up to study creosote fires. The first draft of the Design Handbook for Residential Woodburning has been submitted for review.

32452 (DOE/ET/11288—T4) **Improving the efficiency, safety, and utility of woodburning units. Quarterly report No. WB-2.** Dyer, D.F.; Maxwell, T.F.; Maples, G.; Cooley, I.D.; Badr, O.A.; Stringfellow, N.J.; Barksdale, G.; Quam, A. (Auburn Univ., AL (USA). Dept. of Mechanical Engineering). 15 Mar 1978. Contract AS05-77ET11288. 103p. NTIS, PC A06/MF A01.

Research performed to improve efficiency, safety, and utility of wood heating equipment is reported. The research data are to be translated into practical design and operational formulas enabling both the manufacturer and user of such equipment to accomplish the objectives. Summaries of tasks reported on are: analytical studies; support experimental studies; design and development of standing testing procedures; testing of both domestic and foreign wood burning units; design changes to improve performance of wood burning units; pyrometric and photographic flame studies; and development of practical design correlations.

32453 **Application of a generalized model of air infiltration to existing homes.** Cole, J.T.; Zawacki, T.S.; Elkins, R.H.; Zimmer, J.W.; Macriss, R.A. Chicago, IL; Institute of Gas Technology (1980). 18p. (CONF-800635—4).

From Conference of the American Society of Heating, Refrigeration and Air Conditioning Engineers; Denver, CO, USA (22 Jun 1980).

Examples are presented of the use of a generalized model of air infiltration, developed earlier, to estimate the air infiltration characteristics of two test homes using data for the structures, weather, and furnace installation. One of these is a single-story home with basement, of wood-frame construction, equipped with an oil-fired central space heating furnace. The other is a 2-story interior unit (or a multi-unit low rise structure) with basement, of wood-frame construction, equipped with a gas-fired central space heating furnace. The paper also presents detailed methodologies used with the model to obtain the total effective crackage in each test home, the effect of wind-shielding by adjacent structures, and the characteristic permeability of the structure. Reasonable comparisons of the model-estimated air infiltrations to actual measurements for these test homes are also presented over a wide range of conditions affecting infiltration.

32454 (LBL—9937) **Field air leakage of newly installed residential windows.** Weidt, J.L.; Weidt, J.; Selkowitz, S. (Weidt (John) Associates, Inc., Minneapolis, MN (USA); California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Oct 1979. Contract W-7405-ENG-48. 19p. (CONF-791233—3). NTIS, PC A02/MF A01.

From Conference on thermal performance of the exterior envelopes of buildings; Orlando, FL, USA (3 Dec 1979).

Air leakage characteristics of 192 new windows installed in new residential construction representative of those units commonly installed in the Minneapolis/St. Paul Metropolitan Area have been measured and evaluated. The tested windows represented all major operation types, window material types, and manufacturers represented in this market segment. The air leakage data obtained in the field were compared to industry and government standards and manufacturing reports for reference. Window operation type, manufacturer, installation, construction material, and window defects were analyzed in detail to determine their effects on air leakage. The results of the project indicate that the air leakage of installed windows can be significantly higher than might be expected from laboratory tests. Window operation type was the prime variable in explaining the air leakage performance.

32455 (NP—25002) **Natural gas: its contribution to energy conservation.** (verband der Deutschen Gas- und Wasserwirtschaft e.V./Deutscher Verein des Gas- und Wasserfaches e.V. (BGW/DVGW), Bonn (Germany, F.R.). Kommission Rationelle Energieverwendung). May 1979. 52p. (In German). NTIS (US Sales Only), PC A04/MF A01.

Besides the advantages of an optimum use of the primary energy sources of natural gas compared with the use of secondary energies six new energy-saving technologies are presented: gas-fueled heat pumps, gas-fueled cogeneration units, household heating centers, gas-fueled radiant heaters, improved efficiency of gas furnaces, heat recovery from furnace gases, and natural gas and solar energy. Research and development institutions, training courses, seminars and technical meetings, consumer information, journals, and documentations of the gas industry are discussed as well as measures taken by the state.

32456 (P—400-00-017) **Refrigerator and freezer directory: sort by type. Based on 1977 standards.** (California Energy Commission, Sacramento (USA)). Feb 1980. 28p. California Energy Commission, Sacramento, CA.

The regulations state that no new rerigerator, refrigerator-freezer, or freezer, which was manufactured on or after November 3, 1979, may be sold or offered for sale in California, which is not certified by its manufacturer to be in compliance with the specific standards. On or after November 3, 1980, no new refrigerator, refrigerator-freezer, or freezer regardless of its date of manufacture, may be sold or offered for sale in California, which is not certified by its manufacturer to be in compliance with these standards. Thus, new refrigerators, refrigerator-freezers, or freezers manufactured before November 3, 1979, which comply with the November 3, 1977, standards but not the November 3, 1979, standard may be sold until November 2, 1980. This directory lists such models. Those models which comply with the 1979 standards are listed in another directory. The text of the regulations are found in the California Administrative Code, Title 20, Chapter 2, Subchapter 4, Article 4.

32457 (P—400-80-062) **California plan for the residential conservation service.** Schweickart, R.L.; Doctor, R.D.; Reed, C.S.; Varanini, E.E. III; Walker, J.A. (California Energy Commission, Sacramento (USA)). Jun 1980. 132p. California Energy Commission, Sacramento.

The California Energy Commission has been designated to develop a statewide program to guide utilities in the implementation of the Residential Conservation Service Program in their service area. The RCS Program will ensure that every eligible customer will be entitled to receive the following benefits and services: a program announcement, a home energy audit, and assistance in arranging installation and financing. The California plan divides the energy conservation measures into two categories: energy conservation measures which conserve energy but do not use a renewable energy source, and renewable resource measures which make use of solar energy. These measures are discussed. The CEC estimates that the RCS Program can save about 49 trillion Btu's in California by the end of 1983, representing a savings of 5 to 6% of annual residential energy use.

32458 **Human disease from radon exposures: the impact of energy conservation in residential buildings.** Budnitz, R.J.; Berk, J.V.; Hollowell, C.D.; Nazaroff, W.W.; Nero, A.V.; Rosenfeld, A.H. (Univ of Calif, Lawrence Berkeley Lab). *Energy Build.;* **2**: No. 3, 209-215(Aug 1979).

The level of radon and its daughters inside conventional buildings is often higher than the ambient background level. Interest conserving energy is motivating home-owners and builders to reduce ventilation and hence to increase the concentration of indoor generated air contaminants, including radon. It is possible that the current radiation levels in conventional homes and buildings from radon daughters could account for a significant portion of the lung cancer rate in non-smokers. There are several ways to implement energy conservation measures without increasing risks. 20 refs.

32459 **Contributions of improved technologies to reduced residential energy growth.** Hirst, E.; O'Neal, D. (Oak Ridge Natl Lab, Tenn). *Energy Build.;* **2**: No. 3, 217-224(Aug 1979).

The Oak Ridge National Laboratory residential energy use simulation model is used to evaluate the national energy and direct economic effects of implementing the conservation programs in the proposed National Energy Plan and offering to the market technologies currently being developed by private industry and the Federal government. These changes are likely to cut residential energy use by more than 63.3×10^{18}J between now and the year 2000. The present worth of the fuel bill reductions is /26.7 billion greater than the present worth of the extra capital cost associated with improved equipment, appliances, and structures. 17 refs.

SCHOOL, MUNICIPAL AND OTHER PUBLIC BUILDINGS

REFER ALSO TO CITATION(S) 31969, 32707

32460 (DOE/ET/23136—T1(Vol.1)) **Energy system for the Georgetown University Academic Building. Volume I. Executive summary, final report.** (Georgetown Univ., Washington, DC (USA)). 10 Dec 1979. Contract FG05-79ET23136. 21p. NTIS, PC A02/MF A01.

The energy dilemma facing colleges and universities is addressed. It was determined that a solar photovoltaic facility is technically feasible and immediate initiation of a project to establish a national exemplar for higher education institutions at Georgetown University is recommended. The study demonstrates how long-term

low interest financing, currently available, will make photovoltaic electric power competitive with utility-supplied power by 1983 for most colleges and universities and even 1982 for those in high cost areas.

32461 (ORNL/CON—53) **Energy use in Minnesota public buildings: data management and analysis.** Hirst, E.; Eastes, C. (Oak Ridge National Lab., TN (USA); Minnesota Energy Agency, St. Paul (USA)). Aug 1980. Contract W-7405-ENG-26. 48p. NTIS, PC A03/MF A01.

Data collected by the Minnesota Energy Agency from 1860 public buildings are examined. Considerable attention is devoted to questions of data quality. Validation tests are developed and applied to the data from these buildings. Roughly speaking, 15% of the data elements examined were missing and another 15% were almost surely incorrect. These errors seriously distort both the descriptive statistics and the regression results obtained from further analysis of this data. Examination of the clean data shows that total energy use in the 1977/78 fiscal year ranged from a low of 210 thousand Btu/ft^2 (2.39 billion J/m^2) for the typical garage to a high of 345 thousand Btu/ft^2 (3.92 billion J/m^2) for the typical hospital. More than half the buildings report natural gas and more than one-fourth report fuel oil as the primary heating fuel. Only 13% of the buildings are heated with electricity. Regression equations are developed to explain variations in energy use among buildings for fossil fuel, electricity, and total energy use per unit floorspace. Independent variables include fuel prices, heating degree days, annual operating hours for lights, fraction of the building air conditioned, and dummy variables for primary heating fuel and for hospitals. These equations can be used to help decide which buildings should receive on-site energy audits.

32462 (P—400-80-063) **Energy use surveys for six hospitals: pilot project. Final report.** (Hospital Council of Southern California, Los Angeles (USA); Anco Engineers, Inc., Santa Monica, CA (USA)). Jun 1980. 40p. California Energy Commission, Sacramento.

Results of the pilot project show that energy use surveys, which combine energy audits and detailed technical engineering analyses, are an effective method for identifying the most cost-effective energy conservation measures. The results of the six hospital studies in California show that energy consumption can be reduced by 24.5% and energy costs can be reduced by 23.7% without negatively affecting patient care or the comfort of patients or hospital personnel. Using October 1978 utility rates, this translates into an annual cost reduction of approximately $446,000 for the six hospitals. The total implementation cost to achieve these savings is approximately $374,000. These results appear to be even more dramatic when the energy savings are broken down into two categories: (1) those that cost little or nothing to implement and (2) those that require a more substantial capital investment.

COMMERCIAL AND INDUSTRIAL BUILDINGS

REFER ALSO TO CITATION(S) 31892, 31893, 32472, 32473

32463 **Reducing energy costs in wholesale distribution.** Washington, DC; National Association of Wholesaler-Distributors (1979). 124p. (DOE/TIC—11239).

The National Association of Wholesaler-Distributors made an analysis of energy use and costs in the wholesale distribution industry. These results are documented in the form of specific energy cost reduction recommendations. The recommendations were developed from a series of on-site visits to NAW members. An energy audit of each was then conducted by an engineering firm specializing in energy cost reduction. Each specific operation of a wholesale distribution system was examined and a thorough cost/benefit analysis of every possibility for reducing energy costs was conducted. A series of recommendations was then developed based on short payback period, wide range of applicability, and ease of implementation. Twenty-three recommendations are included that could save businesses money each year.

TRANSPORTATION

AIR AND AEROSPACE

REFER ALSO TO CITATION(S) 32467

32464 (DOE/CS/05438—T1(Vol.3)) **Alternative energy sources for non-highway transportation. Appendices.** (Exxon Research and Engineering Co., Linden, NJ (USA). Government Research Labs.). Jun 1980. Contract AC05-77CS05438. 560p. NTIS, PC A24/MF A01.

A planning study was made for DOE on alternate fuels for non-highway transportation (aircraft, rail, marine, and pipeline). The study provides DOE with a recommendation of what alternate fuels may be of interest to non-highway transportation users from now through 2025 and recommends R & D needed to allow non-petroleum derived fuels to be used in non-highway transportation. Volume III contains all of the references for the data used in the preliminary screening and is presented in 4 subvolumes. Volume IIIA covers the background information on the various prime movers used in the non-highway transportation area, the physical property data, the fuel-prime mover interaction and a review of some alternate energy forms. Volume IIIB covers the economics of producing, tranporting, and distributing the various fuels. Volume IIIC is concerned with the environment issues in production and use of the fuels, the energy efficiency in use and production, the fuel logistics considerations, and the overall ratings and selection of the fuels and prime movers for the detailed evaluation. Volume IIID covers the demand-related issues.

32465 (P—500-80-029) **Feasibility of cogeneration energy supply for Oakland Airport terminal facilities: Consultant report. Final report.** (California Energy Commission, Sacramento (USA)). May 1980. 95p. California Energy Commission, Sacramento.

The feasibility of using a cogeneration system at the Oakland Airport main terminal to provide electric power, heating, and cooling needs is evaluated. Both a reciprocating engine (Otto Cycle) or a combustion turbine (Brayton Cycle) were considered. Waste heat is used for space and water heating along with cooling from absorption chillers. Natural gas engine equipment is the most efficient and cost effective technology for this particular project and would provide 700 kW of electricity, and all of the heating and cooling energy needs. The plant will cost approximately $852,000 to construct, produce annual net operating revenues of approximately $194,000, have an internal rate of return of 19% and an estimated payback period of 4.4 years. This plant will conserve the energy equivalent of 161,000 gal oil per year. Atmospheric emissions can be sufficiently controlled with catalytic converters or water injection. Noise suppression would impose no practical restrictions. Several financing oportunities were considered, either revenue bonds or internal financing by the Port Authority would appear possible.

32466 (PSAD—80-50) **Look at NASA's Aircraft Energy-Efficiency Program.** Staats, E.B. (General Accounting Office, Washington, DC (USA)). 28 Jul 1980. 95p. GPO.

Report to the Congress by the Comptroller General of the United States.

Four years ago the National Aeronautics and Space Administration (NASA) initiated the Aircraft Energy-Efficiency Program to provide by 1985 the technology for making future transport aircraft up to 50% more fuel-efficient than today's aircraft. Thus far, NASA has helped the aircraft industry to improve its current and derivative aircraft, and the program offers continued promise that future aircraft will be significantly more fuel-efficient. The original goals of the program were highly optimistic. Several technologies offering significant fuel-efficiency opportunities probably will not be ready for several years after 1985, and estimated costs have risen significantly. On the basis of this review, GAO says there is need for: (1) NASA to adopt a standard format for concisely and consistently reporting the status of major aeronautical programs to the Congress, and (2) an aeronautics policy which would clarify its role.

RAILWAY

REFER ALSO TO CITATION(S) 32464, 32467

LAND AND ROADWAY

REFER ALSO TO CITATION(S) 31583, 32517, 32518

32467 (DOE/CS/56051—T2) **Solid fuel applications to transportation engines.** (Mueller Associates, Inc., Baltimore, MD (USA)). Jun 1980. Contract AC05-79CS56051. 76p. NTIS, PC A05/MF A01.

The utilization of solid fuels as alternatives to liquid fuels for future transportation engines is reviewed. Alternative liquid fuels will not be addressed nor will petroleum/solid fuel blends except for the case of diesel engines. With respect to diesel engines, coal/oil mixtures will be addressed because of the high interest in this specific application as a result of the large number of diesel engines currently in transportation use. Final assessments refer to solid fuels only for diesel engines. The technical assessments of solid fuels utilization for transportation engines is summarized: solid fuel combustion in transportation engines is in a non-developed state; highway transportation is not amenable to solid fuels utilization due to severe environmental, packaging, control, and disposal problems; diesel and open-cycle gas turbines do not appear worthy of further development, although coal/oil mixtures for slow speed diesels may offer some promise as a transition technology; closed-cycle gas turbines show some promise for solid fuels utilization for limited applications as does the Stirling engine for use of cleaner solid fuels; Rankine cycle engines show good potential for limited applications, such as for locomotives and ships; and any development program

will require large resources and sophisticated equipment in order to advance the state-of-the-art.

32468 (PB—80-132251) **Self-service fare collection. Volume I. Review and summary.** Diebel, L.; Stern, S.; Strickland, L.R.; Sulek, J. (Mitre Corp., McLean, VA (USA). METREK Div.). Aug 1979. 85p. (UMTA-VA—06-0049-79-2; MTR—79W00087-01). NTIS.

European transit properties have widely adopted a method of fare collection known as self-service. Instead of being monitored and controlled by vehicle drivers and station attendants, passengers are allowed virtually unrestricted access to transit service and are responsible for determining and paying the fare themselves; special inspectors are used to check compliance and to penalize passengers who have not paid the correct fare. This report describes the European approach to and rationale for self-service fare collection; documents the experience European transit systems have had with using and enforcing these procedures; and discusses the relative merits of the alternative approaches to self-service with respect to their application in the US. Volume II summarizes the information obtained from a survey of European properties. Volume III describes the hardware required to support self-service fare collection and discusses the trade-offs associated with the various options for its deployment and with the numerous features available through the hardware. Volume IV discusses the legal and labor issues associated with the implementation of SSFC in the United States.

32469 **Gasohol fleet testing project, Land Between The Lakes.** Chattanooga, TN; Tennessee Valley Authority (1980). 22p. (NP—24988).

Fleet testing of gasohol, a blend of 10% ethyl alcohol and 90% unleaded gasoline, was performed at the Land Between The Lakes recreation area in western Tennessee and Kentucky. During the year-long test (March 1979 to March 1980), approximately two million miles were logged by the fleet of 176 vehicles. Analysis of the test data resulted in the following significant findings: a decrease in overall fleet mileage rating of approximately 3% with gasohol which was statistically significant at the 95% level of confidence; fuel savings of approximately 17,000 gallonss of gasoline at an additional cost of roughly $17,000 yearly; increase in fuel-related maintenance after fleet conversion to gasohol, specifically for carburetor components; and no substantial changes in vehicle performance on gasohol with the exception of the occurrence of more driveability problems relating to engine starts in cold weather and vehicle hesitation, bucking, or coughing.

32470 **Ridesharing versus road building: the TVA experience.** Washington, DC; Dept. of Transportation (1980). 13p. (NP—24987).

The TVA ridesharing program at Hartsville demonstrates that bus and vanpools can provide a viable alternative to single occupant automobiles for construction commuter transportation. The program illustrates that money used for conservation instead of costly unneeded auxiliary construction can provide significant social, energy, and environmental benefits. Due to the success of the Hartsville project ridesharing program, TVA has started a similar program at its Yellow Creek Nuclear Plant construction project in Iuka, Mississippi.

32471 **TVA ride-sharing experience.** Knoxville, TN; Tennessee Valley Authority (1977). 18p. (NP—24986).

The major stages in the development of TVA's ride-sharing program are described and the major institutional and legal barriers to ride-sharing are outlined. These barriers include: (1) the complexity and ambiguity surrounding insurance laws; (2) the duplicaton and overlapping jurisdiction of regulatory authorities; and (3) the legal question of whether vanpools compete with licensed regulated carriers. Ride-sharing, particularly vanpooling, grew out of the energy crisis and thus is a reaction to the increase in the price of gasoline. It follows that the growth of ride-sharing in the near future depends on the money cost of competing commuter modes (mainly the auto). However, there are several mechanisms that the Federal government could adopt that would foster the development of ride-sharing. They include: (1) elimination to whatever extent possible the institutional barriers; (2) development of a suitable insurance program to exempt the employer from workmen's compensation claims as well as a method of insuring small fleets; (3) provision of tax incentives and/or subsidies for ride-sharing alternatives; and (4) elimination of Federal restrictions against Federally-owned vehicles transporting employees between their homes and places of work. The impact from the elimination of this Federal restriction would be substantial when one considers that there are approximately three million Federal civilian employees. If the vanpool participation rate at TVA could be replicated at other Federal agencies, the savings in gasoline alone would be approximately 400 million gallons annually.

SEA AND WATER

REFER ALSO TO CITATION(S) 32464, 32467

PIPELINE

REFER ALSO TO CITATION(S) 32464

INDUSTRY AND AGRICULTURE

REFER ALSO TO CITATION(S) 32369, 32370, 32396, 32857

32472 (CONF-790432—(Vol.1)) **Industrial energy conservation technology.** Schmidt, P.S. (ed.). (Texas Univ., Austin (USA)). 1979. Contract FC01-76IR08151. 545p. NTIS, PC A23/MF A01.

From Conference on industrial energy conservation technology and exhibition; Houston, TX, USA (22 Apr 1979).

A separate abstract was prepared for each of 51 papers included in this volume, Vol. 1, of the proceedings. Twenty-one of these abstracts will appear in Energy Abstracts for Policy Analysis.

32473 (CONF-790432—(Vol.2)) **Industrial energy conservation technology.** Schmidt, P.S. (ed.). (Texas Univ., Austin (USA)). 1979. Contract FC01-76IR08151. 541p. NTIS, PC A23/MF A01.

From Conference on industrial energy conservation technology and exhibition; Houston, TX, USA (22 Apr 1979).

A separate abstract was prepared for each of 59 papers included in this volume, Vol. II, of these proceedings. Thirty of the papers were selected for Energy Abstracts for Policy Analysis.

32474 (CONF-790432—(Vol.2), pp 655-664) **Oklahoma Industrial Energy Management Program.** Turner, W.C.; Webb, R.E.; Phillips, J.M.; Viljoen, T.A. (Oklahoma State Univ., Stillwater). 1979.

From Conference on industrial energy conservation technology and exhibition; Houston, TX, USA (22 Apr 1979).

The need for sound energy management is no longer worthy of debate. Action is necessary and much is being done by US industry. Unfortunately, however, the majority of the work is being done by the few large energy-intensive industries throughout the country. The average small/medium-sized company has yet to undertake a dedicated program. The reasons are numerous, but often it is simply because of a lack of knowledge of techniques or the amount of savings possible. Recognizing this, the Oklahoma Department of Energy designed a program to acquaint Oklahoma industry of the potential savings available through energy management and some basic techniques. The program is entitled Oklahoma Industrial Energy Management Program and is housed at Oklahoma State University. The program is funded by the US Department of Energy through the State Energy Conservation Plan. The program offerings, impact of the program to date, and plans for the future are described. The program has been successful to date. The results are directly transferable to other states and the program directors are willing to share information.

32475 (CONF-790432—(Vol.2), pp 670-673) **Energy technology transfer for industry through the Texas Energy Extension Service.** Riter, S. (Texas A and M Univ., College Station). 1979.

From Conference on industrial energy conservation technology and exhibition; Houston, TX, USA (22 Apr 1979).

The Texas Energy Extension Service (EES) is one of ten DOE funded pilot programs designed to test methods for assisting small energy users to reduce energy costs. A major thrust of EES in Texas is directed toward providing assistance to Texas manufacturers. This takes the form of responding to requests for technical information and conducting plant visits to energy-intensive small manufacturers. An evaluation of program effectiveness and assessment of participants' needs was conducted. The evaluation/needs assessment suggests that specific conservation information when delivered by credible organizations is acted upon and leads to reductions in energy costs.

32476 (ORAU—160) **Industrial energy use data book.** Bodine, J.F.; Vitullo, M. (Oak Ridge Associated Universities, Inc., TN (USA)). 1980. Contract EY-76-C-05-0033. 796p. NTIS, PC A99/MF A01.

Industrial use accounts for 36.1% of total US energy consumption. Information about energy use in industry is critically necessary to the formulation of both public and private policies regarding energy conservation, allocation, and production. This document has been prepared to serve as a standard reference for government officials and other groups concerned with policy analysis. Information included covers technical data describing energy use in specific industries and processes and nonengineering data describing the economic, political, and social parameters of industrial energy use. Section I, chapters 1-5, addresses facets of overall industrial energy use. Section II, chapters 6-19, details energy use in the 13 most energy-intensive industrial sectors. Section III, chapters 20-22, presents the important environmental, regional, and social parameters of industrial energy use.

ENERGY SOURCES

REFER ALSO TO CITATION(S) 31571

32477 Some effects of alternate energy policies on California annual crop production. Giannini Foundation research report No. 326. Adams, R.M.; Johnson, W.E.; King, G.A. Berkeley, CA; Giannini Foundation of Agriculture Economics (1978). 99p. (NP—25061).

An attempt was made to measure some general impacts on California agriculture of adjustments in energy costs and availability. The study examined the feasibility of a particular methodological approach, i.e., quadratic programming as applied to large, sectoral-level problems and employed a comparative static quadratic programming model for a base period (1969-1972) and a projection year (1977) to provide quantitative estimates of possible price, quantity, and welfare effects that could be expected as a result of alternative energy input assumptions. The welfare effects of energy price and quantity parameter changes were evaluated by using the concepts of economic surplus. The base period model results suggest that the inclusion of regional energy restraints can affect cropping patterns, especially the sharp reduction in total cropped acreage for the state.

MATERIALS

32478 (CONF-800692—1) **CAD/CAM: improved design quality, increased productivity.** Evans, D.E.; England, J. (EG and G Idaho, Inc., Idaho Falls (USA)). 1980. Contract AC07-76ID01570. 8p. NTIS, PC A02/MF A01.

From 2. annual energy quality assurance conference; Idaho Falls, ID, USA (25 Jun 1980).

Maintaining productivity levels while assuring the quality of engineering products grows increasingly more difficult and costly for industries such as the energy industry which are heavily committed to product design. The man/machine interface made possible through the development of computer-aided design/computer-aided manufacturing (CAD/CAM) technology can be applied to the design process as a tool for increased control to assure the quality of the final engineering product. The quality-control aspects of CAD/CAM technology are addressed in this presentation.

EQUIPMENT AND PROCESSES

32479 (AD-A—075955) **Regenerative burner system for thermoelectric power sources. Technical report.** Guazzoni, G.; Angello, J.; Herchakowski, A. (Army Electronics Research and Development Command, Fort Monmouth, NJ (USA). Electronics Technology/Devices Lab.). Jul 1979. 8p. NTIS, PC A02/MF A01.

A thermoelectric power source is being developed to provide a multifuel, silent, maintenance free tactical power generator for forward area and unattended-operation applications. An experimental study of a regenerative burner system for the 500-Watt Thermoelectric Power Source has resulted in significant reduction in fuel consumption and infrared signature of the power source.

32480 (ANL/OEPM—80-2) **Electrorefining of copper from a cuprous ion complexing electrolyte. II. Experimental comparison of possible alternative electrolytes and preliminary cost engineering analysis.** Brown, A.P.; Loutfy, R.O.; Cook, G.M. (Argonne National Lab., IL (USA)). Apr 1980. Contract W-31-109-ENG-38. 33p. NTIS, PC A03/MF A01.

The energy saving potential and refining capability of three copper(I)/electrolyte systems for the electrorefining of copper were compared experimentally. The alternative electrolyte systems studied were copper(I)/acid chloride, copper(I)/acetonitrile and sulfuric acid, and copper(I)/ammonia solutions. These were compared to the conventional copper(II)/sulfuric acid electrolyte. All of the alternative electrolyte systems demonstrated at least some potential for saving energy when run at an equal deposition rate to the conventional process; the chloride electrolyte showed the greatest energy saving potential, about 70%, and the ammonia electrolyte showed the least, about 25%. All of the alternative electrolyte systems, however, exhibited performance problems, primarily with regard to inadequate separation of impurities. A preliminary capital cost estimate was made for the copper(I)/chloride system. This estimate showed that, for the alternative electrolyte system to be cost competitive (that is, a reduction of capital cost of about 15 to 20%) with the conventional electrorefining process, the refining cells would have to be operated at a current density of about 25 to 30 $mA\text{-}cm^{-2}$. At this current density, the estimated energy saving potential for the copper(I)/chloride system was still about 50%.

32481 (BNL—51073) **Iron and steel industry process model.** Sparrow, F.T.; Pilati, D.; Dougherty, T.; McBreen, E.; Juang, L.L. (Brookhaven National Lab., Upton, NY (USA). National Center for Analysis of Energy Systems). Jan 1980. Contract AC02-76CH00016. 69p. NTIS, PC A04/MF A01.

The iron and steel industry process model depicts expected energy-consumption characteristics of the iron and steel industry and ancillary industries for the next 25 years by means of a process model of the major steps in steelmaking, from ore mining and scrap recycling to the final finishing of carbon, alloy, and stainless steel into steel products such as structural steel, slabs, plates, tubes, and bars. Two plant types are modeled: fully integrated mills and minimills. User-determined inputs into the model are as follows: projected energy and materials prices; projected costs of capacity expansion and replacement; energy-conserving options, both operating modes and investments; the internal rate of return required on investment; and projected demand for finished steel. Nominal input choices in the model for the inputs listed above are as follows: National Academy of Sciences Committee on Nuclear and Alternative Energy Systems Demand Panel nominal energy-price projections for oil, gas, distillates, residuals, and electricity and 1975 actual prices for materials; actual 1975 costs; new technologies added; 15% after taxes; and 1975 actual demand with 1.5%/y growth. The model reproduces the base-year (1975) actual performance of the industry; then, given the above nominal input choices, it projects modes of operation and capacity expansion that minimize the cost of meeting the given final demands for each of 5 years, each year being the midpoint of a 5-year interval. The output of the model includes the following: total energy use and intensity (Btu/ton) by type, by process, and by time period; energy conservation options chosen; utilization rates for existing capacity; capital-investment decisions for capacity expansion.

32482 (BSDF—38-3Q-80) **Evaporation by mechanical vapor recompression. Technical progress report, April 1, 1980-June 30, 1980.** Iverson, C.H.; Coury, G.E. (Beet Sugar Development Foundation, Fort Collins, CO (USA)). 1980. Contract AC03-79CS40208. 81p. NTIS, PC A05/MF A01.

The expected performance and estimated capital cost are presented of two schemes for the application of mechanical vapor recompression to a conventional, low pressure, five effect juice evaporator in a beet sugar factory. Due to the constraints of the existing system and the desire to make the most effective use of the capital investment, the recommendation is to install Scheme B. This selection recognizes the inability of the falling film evaporator to respond to rapid and frequent changes in capacity, and upon the need to raise the first effect vapor pressure to allow utilization of first effect bleed vapor to boil the white sugar crystallization pan. The recommended installation, Scheme B, is predicted to reduce the hourly steam consumption by up to 10,477 #/hr for an annual fuel savings of $126,800 on today's fuel cost at the Greeley Factory of the Great Western Sugar Company. This represents a 9.35% reduction in the amount of steam generated during the base year of 1978 to 1979. The estimated capital cost of the installation is $825,000.

32483 (BSDF—39-3Q-80) **Technical and economic feasibility of membrane technology.** Sandre, A. (Beet Sugar Development Foundation, Fort Collins, CO (USA)). 1980. Contract AC03-79CS40213. 27p. NTIS, PC A03/MF A01.

The potential application of reverse osmosis, ultrafiltration, and electrodialysis to the system of solids concentration in beet sugar process streams is being investigated. All available membranes potentially applicable to the process are being tested for application and durability under typical pH, heat, pressure and recycle conditions. Progress in achieving a possible reduction of energy requirements for evaporation by 15% to 20% is reported.

32484 (CONF-790432—(Vol.2), pp 637-645) **Energy-conservation R, D, and D programs in high-temperature processes.** Sheneman, R.L. (Dept. of Energy, Washington, DC). 1979.

From Conference on industrial energy conservation technology and exhibition; Houston, TX, USA (22 Apr 1979).

The history and background of those elements of industry responsible for current practices of energy consumption are discussed briefly, specifically those processes requiring high temperatures. Potentials for energy conservation in high-temperature processes are elaborated for: coal-fired aluminum remelting; direct reduction of aluminum; hot inspection and scarfing of steel; electric-arc-furnace modeling; cupola furnace; new processes in copper production; improved slot-forge furnace; fluidized-bed heat treatment; aluminum-cathode development; glass conglomerates; and continuous casting.

32485 (DOE/CS/4431—T1) **Energy conservation: a route to improved distillation profitability. Executive briefing report, technology transfer.** (Radian Corp., Austin, TX (USA)). 1980. Contract W-31-109-ENG-38. 29p. NTIS, PC $6.50/MF $3.50.

The savings potential of energy-conservation measures applied to distillation is examined. The document catalogs all of the various energy-conservation options applicable to distillation; categorizes the options by investment required; and describes in detail the options having a significant potential to reduce distillation energy requirements economically. A technology applications manual designed to assist distillation process engineers who will perform technical and economic analyses to determine the conservation measures most suitable for their particular plant is also available (DOE/CS/4431-T2).

32486 (DOE/CS/4431—T2) **Energy conservation in distillation: a technology applications manual.** (Radian Corp., Austin, TX (USA)).

May 1980. Contract W-31-109-ENG-38. 54p. NTIS, PC E03/MF $3.50.

Distillation is the most widely practiced technique for separating mixtures of chemical species, but it is an energy intensive process. A 10% reduction in distillation energy consumption would effect a significant savings. On a national basis this would be an annual savings of 200 trillion Btu, or the equivalent of 36.5 million barrels of oil per year. Technology to achieve these savings in distillation energy is available and measures are presented to assist process engineers in technical and economic analysis of the energy conservation measures most suitable for particular distillation applications. The manual catalogs all of the energy conservation options applicable to distillation and the options by the investment required; describes in detail the options having a significant potential to reduce distillation energy requirements economically; provides guidelines that will allow the plant engineer to quickly screen each option for his application; and provides short-cut calculation procedures for use in a preliminary economic analysis of promising options.

32487 (DOE/CS/40034—T1) **Investigation of freeze concentration as a process for industrial energy conservation in black liquor, acetic acid, and citrus juice applications. Final report.** (Concentration Specialists, Inc., Andover, MA (USA)). Jul 1979. Contract AC01-78CS40034. 173p. NTIS, PC A08/MF A01.

One of the largest consumers of energy in industrial processing is the equipment that concentrates weak aqueous solutions to stronger more sellable or reusable concentrations. The technical and economic feasibility of applying freeze concentration (that is, crystallization and removal from solution of pure solvent - water) as an alternative to heat evaporation (or distillation) to three industrial applications is established. For each of the applications - pulp mill black liquor concentration, acetic acid recovery and orange juice concentration - the economic analyses indicate that the energy savings achievable by freezing justify the respective capital investments with pay out periods of generally one to three years. Past freeze concentration operations have been in the 10,000 to 100,000 gallons per day range for sea water desalination. Research and development work will be required to adapt this work to the three industrial applications.

32488 (DOE/OR/05379—T1) **Research on cavitating hydrojet descaling techniques for improving the efficiency of industrial boiler tubes.** Howard, S.C. (Daedalean Associates, Inc., Woodbine, MD (USA)). Jan 1978. Contract AC05-77OR05379. 61p. NTIS, PC A04/MF A01.

The feasibility for utilizing a hydrojet system for the cavitating of industrial boiler tubes was examined. The cavitating descaling technique was successfully demonstrated in the laboratory to be a viable technique for removing the scale deposits from the surfaces of industrial boiler tubes. The cavitating water jet technique is both simple and reliable, would result in energy savings, as compared with conventional mechanical cleaning techniques, and would eliminate the possibility of damaging the tubes so prevalent with mechanical reamers or acid flushings. The performance data for several nozzle designs were generated which will allow the correct nozzle to be chosen for a specific type of descaling application. The engineering design charts produced as a result of this program will allow optimization of component size and of operating conditions for a multipurpose pipe and tube cleaning system for removing the scale.

WASTE HEAT RECOVERY AND UTILIZATION

32489 (CONF-790432—(Vol.1), pp 98-102) **Department of Energy program for development of industrial heat-recovery equipment.** Eustis, J.N. (Dept. of Energy, Washington, DC). 1979.

From Conference on industrial energy conservation technology and exhibition; Houston, TX, USA (22 Apr 1979).

Development of heat-recovery equipment in DOE programs is summarized. The industrial heat recovery equipment development is carried out primarily in the areas of recuperators and heat pumps, with some work in organic Rankine-cycle power units and novel waste-heat boilers. Basic work in heat-exchanger design described includes: better understanding of heat-transfer mechanism; fouling mechanisms and flow induced vibrations; development of corrosion-resistant materials; and de-scaling techniques.

32490 (CONF-790432—(Vol.2), pp 747-756) **Thermal energy storage/waste heat recovery applications in the cement industry.** Beshore, D.G. (Martin Marietta Aerospace, Denver, CO); Jaeger, F.A.; Gartner, E.M. 1979.

From Conference on industrial energy conservation technology and exhibition; Houston, TX, USA (22 Apr 1979).

The cement industry is the most energy-intensive industry in the United States in terms of energy cost as a percentage of the material according to a 1973 report by the Cost of Living Council. Martin Marietta Aerospace, Denver Division, and the Portland Cement Association have studied the potential benefits of using waste-heat-recovery methods and thermal-energy-storage systems in the cement-manufacturing process. The study illustrates very attractive cost benefits realized from waste-heat recovery/thermal-storage systems. The sources of rejected energy in the cement-manufacturing process, uses of this energy, various energy-storage concepts, and a methodology for selection of most-promising energy-storage systems are examined. Two storage systems show the best promise - rockbeds and draw salt storage. Thermal performance and detailed economic analyses have been performed on these systems and results are presented. Through the use of thermal energy storage in conjunction with waste-heat electric-power-generation units, an estimated 2.4 x 10^{13} Btu per year, or an equivalent of 4.0 x 10^{6} barrels of oil per year, can be conserved. Very attractive rates of return on investment of the proposed systems are an incentive for utilization and further development.

32491 (CONF-790432—(Vol.2), pp 918-931) **Organic Rankine cycles for the petrochemical industry.** Rose, R.K.; Colosimo, D.D. (Mechanical Tech. Inc., Latham, NY). 1979.

From Conference on industrial energy conservation technology and exhibition; Houston, TX, USA (22 Apr 1979).

Under a cooperatively funded DOE/MTI program, a packaged Rankine power-recovery system is being developed specifically to meet the needs of the petroleum refinery and chemical industries. The system under development is a system based on a conventional fluorocarbon refrigerant to generate a nominal 1000 kW from typical liquid and vapor streams in the process plant. The 220°F nominal turbine-inlet temperature of the unit is well suited to the 250 to 350°F typical of these streams. The organic Rankine power package will be in operation at MTI's Energy Test Facility in late 1979. The first field-test demonstration unit is scheduled to be shipped in late 1980. The program, the organic Rankine package, and the economics of its application in the petrochemical process industry are described.

32492 (P—500-80-018) **Cotton gin trash incinerator-air heat project.** Lang, R.C. (California Energy Commission, Sacramento (USA)). May 1980. 29p. California Energy Commission, Sacramento, CA.

The California Energy Commission has funded the final phase of a four year project by Norman Pitt, Inc. resulting in development of a successful system for burning cotton gin trash as a fuel providing the heat for ginning. Gin trash, a residue of the ginning process, having a heat value of about 6000 Btu/lb, is burned in a special 24 million Btu furnace under controlled conditions avoiding slagging. The hot combustion gases pass through heat exchangers to heat clean air for use in the gin dryers. Sufficient trash is evolved in ginning to supply all of the fuel needs for hot air production, approximatley 12 million Btu's/h, replacing fossil fuel consumption for this purpose. The incinerator - air heater system installed in Corcoran, California operates continuously throughout the ginning season. Trash feeding and burning rate is automatically controlled from the combustion temperature, hot air temperature is controlled by the drying needs, and ashes are automatically removed from the system and pneumatically conveyed to the disposal site. The system complies with state and county air pollution codes by means of baghouse collectors. Savings in fossil fuel and trash disposal costs have demonstrated the equipment system is feasible for a four year payback at large, well utilized gins.

32493 (P—500-80-027) **Feasibility study of a waste-fueled, fluidized bed cogeneration facility: consultant report.** (California Energy Commission, Sacramento (USA)). May 1980. 46p. California Energy Commission, Sacramento, CA.

The feasibility of establishing an independent company that would engage in the sale of process steam and electricity to food processing facilities in the San Joaquin Valley of California was studied. This energy would be produced by a fluidized bed reactor with a waste heat boiler and a steam turbine generator fired by waste fuels such as orchard clippings. As proposed, the combustion facility will consume approximately 59,5000 tons of waste annually. Energy production is expected to be 23,00 pounds of steam per hour and 3 MW of electricity. The total capital expenditures required are $3,006,000. Annual sales are projected at $1,131,600. Waste fuel costs are projected at $387,993 per year and energy complex operating costs are projected at $589,840, leaving a projected profit of $167,767 per year. However, the simple payback is about 20 years. The major conclusions of the study are: a joint venture of some type between the customer and the energy production is probably more practical than a truly independent entity; there appear to be no significant technological barriers to implementing the proposed concept; waste fuels are available at effective costs lower than current fuel alternatives for producing and/or acquiring steam and electricity; and the project as designed, with its attendant risks does not result in a sufficient return to attract private investment capital. It is likely that some type of governmental support would be required if the proposed concepts were to be tested in actual practice.

INDUSTRIAL WASTE MANAGEMENT

REFER ALSO TO CITATION(S) 31525, 31830, 31851, 32189, 32193, 32208, 32504, 32707

32494 (BM-RI—8419) **Solvent extraction of cobalt from laterite-ammoniacal leach liquors.** Nilsen, D.N.; Siemens, R.E.; Rhoads, S.C. (Bureau of Mines, Albany, OR (USA). Albany Research Center). 1980. 23p. Bureau of Mines, Pittsburgh, PA.

The Bureau of Mines is developing a method to recover Ni, Co, and Cu from laterites containing less than 1.2% Ni and 0.25% Co. The method consists of the following basic unit operations: (1) reduction roasting, (2) leaching, (3) solvent extraction, and (4) electrowinning. The method reflects three Bureau of Mines objectives: (1) recovery of critical minerals that are domestically in short supply from low-grade domestic laterites, (2) lower processing energy requirements, and (3) solution recycling. This report deals with the extraction of cobalt and the preparation of a suitable cobalt electrolyte by solvent extraction from liquor produced by this method. Nickel and copper are coextracted with LIX64N from an ammoniacal ammonium sulfate leach liquor containing about 1.00 g/1 Ni, 0.30 g/1 Co, 0.03 g/1 Cu, and 0.02 g/1 Zn. Cobalt (III) in the nickel-copper barren raffinate is reduced to cobalt (II) with cobalt metal. Reduction of cobalt (III) to cobalt (II) greatly aids subsequent extraction. Commercially available XI-51 extracts about 94% of the cobalt from the treated raffinate in one stage in a laboratory mixer-settler continuous circuit. Ammonia loaded on the solvent is removed in two washing steps. About 94% of the cobalt then is stripped from the XI-51 in one stage with spent cobalt electrolyte containing about 77 g/1 Co and 18 g/1 sulfuric acid (H_2SO_4). Electrolytes containing less H_2SO_4 also may be used. Preliminary data indicate that coextracted zinc may be removed from pregnant cobalt electrolyte containing 3 g/1 or less H_2SO_4 with di-(2 ethylhexyl) phosphoric acid (D2EHPA).

32495 (EPA—600/8-80-026) **Industrial wastewater.** (Environmental Protection Agency, Washington, DC (USA). Office of Research and Development). Jun 1980. 33p. Environmental Protection Agency, Cincinnati, OH.

Most industrial waste water is discharged back into its source in a degraded state which may pose a threat to public health. EPA's Office of Research and Development produces the scientific data and technology necessary for development of effective pollution control strategies and environmental standards. Summaries are presented of the two research categories: treatment and reuse and recycling and other process modifications.

MUNICIPALITIES AND COMMUNITY SYSTEMS

32496 (NP—25000) **Role of the planner in comprehensive community energy management.** Cartwright, J.M. (Tennessee Valley Authority, Knoxville (USA)). Jan 1979. 33p. NTIS, PC A03/MF A01.

The role of the professional planner is identified as planning the issues that affect community energy management and planning tools that encourage energy conservation. Part I of this report discusses such planning issues as population densities, transportation linkages, land-use patterns, and the location of activities. These issues can be resolved in a manner that encourages a compact development pattern that is energy-efficient. In many cases, these issues are resolved in a way that encourages isolated rural development and underdeveloped urban areas, both energy-intensive development patterns. Parts II and III discuss various planning tools for comprehensive, community energy management. Since many of these tools are ordinances and regulations that are to be used as supplements to a community's existing zoning ordinance and subdivision regulations, Part IV details recommended modifications to local ordinances and regulations. It is left to the discretion of the local government to utilize all or any combination of these planning tools for energy management.

32497 (NP—25001) **Community Energy Management Plan, Norris, Tennessee.** Cartwright, J.M. (Tennessee Valley Authority, Knoxville (USA)). Jul 1979. 34p. NTIS, PC A03/MF A01.

The workplan for the city of Norris, Tennessee, to manage energy is described. It defines the tasks to be performed and the time frame for each task, and identifies task responsibilities. The effort identifies the local uses of energy, the types of energy consumed, community energy goals, and implementation strategies for those goals. The local energy planning committees identified 12 projects to be pursued. These include the installation of 25 solar water heaters and 25 wood stoves in Norris residences; establishing a convenient and economical source of firewood; insulating 60 Norris homes following TVA standards; establishing additional vanpools; utilizing 2 electric cars for intracity movement of TVA personnel; constructing 5 solar homes in the community; developing energy conscious land use plan and building codes; encouraging more walking and bicycling to work and school; starting an energy materials cooperative; incorporating energy conserving concepts in the proposed Norris Community Center; and developing energy education projects to communicate the need to conserve energy.

PUBLIC SERVICES

32498 **Conversion of the city of Sunnyvale streetlighting system to sodium vapor. Volume II. Appendix; comments.** Sacramento, CA; California Energy Commission (1980). 250p. (NP—24993(Vol.2)).

Results of a study made to determine what type of sodium vapor system would be most efficient, in terms of energy use, lifetime costs, and photometric performance for streetlighting in Sunnyvale, California, are presented. Volume I contains results of the technical data. Volume II contains information in appendixes on conversion of Oakland streetlighting; Norelco roadway lighting survey; the American National Standard Practice for Roadway Lighting; and the CIE publication recommendations for the lighting of roads for motorized traffic. Some photographs of Sunnyvale streets are included. Extensive comments on the report are included from the California Energy Commission Staff; General Electric; North American Philips Lighting Corporation; the cities of Oakland, Norwalk, Long Beach; PG and E; San Diego Gas and Electric; Lick Observatory; and the consultant's response.

32499 **Conversion of the city of Sunnyvale streetlighting system to sodium vapor. Volume I. Technical report.** Sacramento, CA; California Energy Commission (1980). 150p. (NP—24993(Vol.1)).

Results of a study made to determine what type of sodium vapor system would be most efficient, in terms of energy use, lifetime costs, and photometric performance for streetlighting in Sunnyvale, California, are presented. Volume I contains results of the technical report and includes chapters on a review of the Sunnyvale streetlighting system; the Sunnyvale System Retrofit (lighting standards, photometric performance, cost analyses, PG and E luminaires); generic issues in streetlighting (visual acuity, lamp luminaire characteristics, color acceptability, skyshine, and spill/security lighting); and measurement of luminaire performance.

PUBLIC UTILITIES

REFER ALSO TO CITATION(S) 32455

32500 (ANL/ES—96) **Assessment of external combustion, Brayton-cycle engine potential in total and integrated energy systems.** Marciniak, T.J.; Bratis, J.C.; Davis, A.; Jain, M.L.; Ashe, T.L.; Six, L.D.; Trimble, S.W. (Argonne National Lab., IL (USA)). Mar 1980. Contract W-31-109-ENG-38. 112p. NTIS, PC A06/MF A01.

The history, advantages, disadvantages, and performance and cost characteristics of the external-combustion, Brayton engine are discussed. Included are studies of external combustion, Brayton engines in Integrated Energy Systems, and comparisons with current technologies, such as diesels and gas turbines, as well as with other advanced prime-mover technologies, such as large Stirling engines and adiabatic turbocompound diesel engines. Lastly, a development program, one that would lead to a commercializable external combustion, Brayton engine using an atmospheric fluidized bed combustor is described. The fluidized bed offers a method for burning coal in an environmentally acceptable manner at a fairly reasonable cost so that the external combustion Brayton concept can be used in the residential/commercial sector. Based on this study, it appears that the external combustion, Brayton engine, using a fluidized-bed combustion system, offers a technologically sound alternative for developing an economically viable, environmentally acceptable method for using non-scarce fuels. Although the efficiency of the engine is not as high as that projected for large diesel and Stirling engines, the capital cost advantages, fuel flexibility, relatively low developmental costs, and high chance of success make it an attractive alternative.

32501 (CONF-800598—) **Co-sponsored second quarter progress review conference on district heating.** (Department of Energy, Washington, DC (USA). Assistant Secretary for Conservation and Solar Energy). 1980. 209p. NTIS, PC A10/MF A01.

From Progress review conference on district heating; Detroit, MI, USA (29 May 1980).

A summary of the progress review conference on district heating and cooling systems is presented. The agenda and lists of speakers and attendees are presented. A history of district heating and some present needs and future policies are given and an excerpt from the National District Heating Program Strategy (DOE, March 1980) is included. Following the presentation, District Heating and Cooling Systems Program, by Alan M. Rubin, a fact sheet on DOE's Integrated Community Energy Systems Program and information from an oral presentation, District Heating and Cooling Systems for Communities Through Power Plant Retrofit Distribution Network, are given. The Second Quarterly Oral Report to the US DOE on the District Heating and Cooling Project in Detroit; the executive summary of the Piqua, Ohio District Heating and Cooling Demon-

stration Project; the Second Quarterly Report of the Moorehead, Minnesota District Heating Project; and the report from the Moorehead, Minnesota mayor on the Hot Water District Heating Project are presented.

32502 (EPRI-EM—1436) **Dual energy use systems: district heating survey. Final report.** (EUS, Inc., Pittsburgh, PA (USA); Hittman Associates, Inc., Columbia, MD (USA)). Jul 1980. 161p. NTIS, PC A08/MF A01.

The EPRI Dual Energy Use Systems (DEUS) District Heating Survey project identifies the current status of and problems of district-heating systems operated by electric utilities, and evaluates the technical and economic factors which can affect the present and future success of district-heating systems in the United States. In particular, the current use and future potential of dual energy use systems such as cogeneration are evaluated. Fifty-nine district-heating electric utilities were surveyed, with questions to obtain data on technical, economic, regulatory, and marketing factors included. Literature on district heating in the US and abroad was collected from governments, industry, and other sources, and reviewed. Interviews were held with executives of 16 utilities that operate district-heating systems and with executives of 15 utilities that do not operate district-heating systems in order to determine corporate attitudes. A summary of the literature obtained is provided. Survey results are tabulated and described. The interviews and survey data were used to compile 10 case studies of utilities operating district-heating systems under a broad range of circumstances. Recommendations for future investigations of district-heating potential are provided.

32503 (NP—24977) **Ordinance concerning the standard conditions governing long-distance heat supply (AVB Fernwaerme V).** (Bundesrat, Bonn (Germany, F.R.)). 12 Feb 1980. 64p. (In German). NTIS (US Sales Only), PC A04/MF A01.

The conception of this ordinance concerning long-distance heat supply for district heating, (AVB Fernwaerme V), is largely the same as that of the two other ordinances relating to power and to gas supply; the provisions laid down in this ordinance take into account requirements and problems from the field of power economy as well as technical and legal problems and the requirements of consumer protection.

MUNICIPAL WASTE MANAGEMENT

REFER ALSO TO CITATION(S) 32810

32504 (DOE/CS/20178—01) **Resource recovery: research development and demonstration plan.** Scaramelli, A.B. (Mitre Corp., Bedford, MA (USA)). Oct 1979. Contract AC01-78CS20178. 426p. NTIS, PC A19/MF A01.

Implementation of resource recovery is being retarded by technological uncertainties and institutional impediments. Development and commercialization of new competitive technologies are not proceeding rapidly because a structured development program for the industry is lacking. The US Department of Energy (DOE) has recognized these problems, and as part of its overall program in energy recovery from urban waste, it is developing a near- and longer-term research, development, and demonstration (RD and D) program to accelerate commercialization of promising resource recovery technologies. The MITRE Corporation was contracted to develop a near-term RD and D Plan for resource recovery which identifies actions which should be taken over the next three years to accelerate commercialization of existing and developing technologies. The research needs presented in this Plan exist in the industry today. The resolution, however, is not necessarily the sole responsibility of DOE, but rather calls for a combination of public and private sector efforts. An individual research program is presented for each resource recovery technology. A program consists of a combination of bench-, pilot-, demonstration-, and full-scale process and equipment evaluations as well as qualitative and quantitative studies. Each research program is tailored to alleviate the problems of a technology such that their resolution will accelerate the rate at which the technology advances toward commercial readiness and realizes commercial implementation. All the research needs identified are actions which should be taken in the next three years to advance the field of resource recovery.

32505 (DOE/EV/10133—T1) **Characterization and environmental studies of Pompano Beach anaerobic digestion facility. Semi-annual report.** Sengupta, S.; Farooq, S.; Gerrish, H.P.; Wong, K.F.; Daly, E.L. Jr.; Chriswell, C. (Miami Univ., Coral Gables, FL (USA). Dept. of Mechanical Engineering). Feb 1980. Contract AS05-78EV10133. 190p. NTIS, PC A09/MF A01.

Anaerobic digestion of municipal waste has been demonstrated to be feasible in bench scale experiments by Pfeffer (1974). Approximately, 50% reduction in mass and production of 6000 ft^3 of gas/ton have been estimated. The gas composition is estimated to be 50% methane and 50% carbon monoxide. The technical and economic feasibility of anaerobic digestion with an ultimate objective of commercialization are discussed. A plant has been built at Pompano Beach, Florida on an existing shredding and landfill operation site. The plant design capacity is 100 tons/day. Two digesters have been constructed to be used in parallel. The process consists of primary shredding, metal separation, secondary shredding, air classification and digestion of light fraction. Sewage sludge was used to seed the initial mixture in the digester. The output slurry is vacuum filtered and the filter cake disposed on an existing landfill. The filtrate is recycled. Excess filtrate is sprayed on the landfill. At present the output gas is being flared. A flow chart for the plant is presented. It is imperative that environmental investigations be conducted on new energy technology prior to commercialization. A project was initiated to characterize all input and output streams and to assess the potential for ground water contamination by landfill disposal of effluents. Detailed chemical, biological and physical characterization efforts supported by leaching and modelling studies are being conducted to achieve the stated objectives. Some mutagenic studies were also conducted. The environmental investigations were started in August 1978. Sengupta et al (1979a) reported the first year's efforts.

32506 (OTA-M—93) **Materials and energy from municipal waste.** (Office of Technology Assessment (U.S. Congress), Washington, DC). Jul 1979. 291p. GPO.

The United States annually generates more than 135 million tons of municipal solid waste (MSW). Its disposal is a rapidly growing problem for many areas of the country, where such traditional methods as open dumping, landfill, uncontrolled incineration, and ocean burial are too expensive or environmentally unacceptable. Resource recovery and recycling materials and energy from MSW can play significant roles in helping to solve waste generation and disposal problems. In addition, resource recovery, recycling, and reuse can contribute to the wise and efficient use of materials, to conserving energy, to preserving the environment, and to improving the balance of trade by reducing our dependence on imported natural resources. By using materials more than once, virgin resources can be conserved for ourselves and for future generations. The feasibility of various approaches to resource recovery, recycling, and reuse are discussed. The results of an examination of influential technological, economic, and institutional factors are presented. Federal policies that might stimulate resource recovery, recycling, and reuse were identified and their effectiveness and impacts were assessed. The criteria used for assessing the policy options include technical and administrative feasibility (effectiveness), economic efficiency, equity, security, and diversity. Only those problems and opportunities associated with the disposal of ordinary MSW in the United States were studied. The management of hazardous wastes, sewage sludges, and other special wastes; remanufacturing, reworking, or refurbishing products for reuse; recycling industrial scrap; and recovering materials or energy from agricultural, forestry, mining, or industrial residues, were specifically excluded.

EDUCATION AND PUBLIC RELATIONS

REFER ALSO TO CITATION(S) 31585

32507 (DOE/IR/06065—1(Pt.1)) **Providing for energy efficiency in homes and small buildings. Part I. Understanding and practicing energy conservation in buildings.** (American Association for Vocational Instructional Materials, Athens, GA). Jun 1980. Contract AC01-77IR06065. 87p. NTIS, PC A05/MF A01.

This is a training program to educate students and individuals in the importance of conserving energy and to provide for developing skills needed in the application of energy-saving techniques that result in energy-efficient buildings. A teacher guide and student workbook are available to supplement the basic guide, which contains three parts. Part I considers the following: understanding the importance of energy; developing a concern for conserving energy; understanding the use of energy in buildings; care and maintenance of energy-efficient buildings; and developing energy-saving habits. A bibliography is presented.

32508 (DOE/IR/06065—1(Pt.2)) **Providing for energy efficiency in homes and small buildings. Part II. Determining amount of energy lost or gained in a building.** (American Association for Vocational Instructional Materials, Athens, GA). Jun 1980. Contract AC01-77IR06065. 36p. TIC.

The training program is designed to educate students and individuals in the importance of conserving energy and to provide for developing skills needed in the application of energy-saving techniques that result in energy-efficient buildings. There are 3 parts to the training program. They are entitled: Understanding and Practicing Energy Conservation in Buildings; Determining Amount of Energy Lost or Gained in a Building; and Determining Which

Practices Are Most Efficient and Installing Materials. For Part Two, it is recommended that cooling and heating load calculation manual (GRP 158) ASHRAE, 1979, be used. Specific subjects covered in Part II are: Terms Used to Measure Energy in Buildings; Understanding Heat Losses and Gains in Buildings; Estimating Heating Loads in Buildings; Special Applications for Estimating Cooling Loads in Buildings; Estimating Cooling Loads in Buildings; and Determining Cost Benefits of Using Energy-Saving Practices.

32509 (DOE/IR/06065—1(Pt.3)) **Providing for energy efficiency in homes and small buildings. Part III. Determining which practices are most effective and installing materials.** (American Association for Vocational Instructional Materials, Athens, GA). Jun 1980. Contract AC01-77IR06065. 114p. TIC.

The training program is designed to educate students and individuals in the importance of conserving energy and to provide for developing skills needed in the application of energy-saving techniques that result in energy-efficient buildings. A teacher guide and student workbook are available to supplement the basic manual. Subjects covered in Part III are: determining which practices are most efficient and economical; installing energy-saving materials; and improving efficiency of equipment.

32510 (DOE/IR/06065—1(Pt.4)) **Providing for energy efficiency in homes and small buildings: teacher guide.** (Fraser/Associates, Washington, DC (USA)). Jun 1980. Contract AC01-77IR06065. 30p. NTIS, PC A03/MF A01.

A teacher guide to the basic manual, providing for energy efficiency in homes and small buildings, is presented. Three parts to the manual are: understanding and practicing energy conservation in buildings; determining amount of energy lost or gained in a building; and determining which practices are most efficient and installing materials. The guide gives answers to questions in the student workbook and directions for special exercises and problems related to the subject.

ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

INTERNAL COMBUSTION ENGINES

REFER ALSO TO CITATION(S) 32390

32511 (LBL—10868) **Experimental and theoretical study of heat transfer with combustion.** Heperkan, H.A. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). May 1980. Contract W-7405-ENG-48. 182p. NTIS, PC A09/MF A01.

Thesis.

For internal combustion engines, a knowledge of the heat transfer to the walls is important for determining the quenching of wall reactions leading to high carbon emissions, the durability of engine components, and the loss of energy from the gases in the combustion chamber. The determination of the heat transfer during combustion is reported. A number of experiments were performed in a shock tube to determine the heat flux at the wall. A combustible mixture, $2H_2 + O_2 + 27Ar$, was used as the test gas. The gas was ignited by a reflected shock wave. A detonation wave was formed which moved away from the wall while the combustion zone diffused slowly toward the wall. The wall heat flux was determined by utilizing the measurement of the wall temperature variation with respect to time using a thin film platinum resistance thermometer. In addition a determination of the heat flux was also made by solving the conservation equations in the gas boundary layer near the wall. The results yielded values for the location of the combustion zone as a function of time. The combustion zone diffused slowly toward the end wall and then remained at a constant distance away from the wall. This distance can be considered as a quenching distance for the combustion zone. A set of experiments was also performed in a constant volume vessel. The wall heat flux was calculated in the presence of a flame propagating towards the wall. A methane-air mixture at an equivalence ratio of 1 was used. The gas was ignited by a spark plug mounted on the wall.

32512 (P—500-80-14) **Methanol/ethanol/gasoline blend-fuels demonstration with stratified-charge-engine vehicles: Consultant report. Final report.** Pefley, R.; Adelman, H.; Suga, T. (California Energy Commission, Sacramento (USA)). Mar 1980. 127p. California Energy Commission, Sacramento.

Four 1978 Honda CVCC vehicles have been in regular use by California Energy Commission staff in Sacramento for 12 months. Three of the unmodified vehicles were fueled with alcohol/gasoline blends (5% methanol, 10% methanol, and 10% ethanol) with the fourth remaining on gasoline as a control. The operators did not know which fuels were in the vehicles. At 90-day intervals the cars were returned to the Univerity of Santa Clara for servicing and for emissions and fuel economy testing in accordance with the Federal Test Procedures. The demonstration and testing have established the following: (1) the tested blends cause no significant degradation in exhaust emissions, fuel economy, and driveability; (2) the tested blends cause significant increases in evaporative emissions; (3) analysis of periodic oil samples shows no evidence of accelerated metal wear; and (4) higher than 10% alcohols will require substantial modification to most existing California motor vehicles for acceptable emissions, performance, and fuel economy. Many aspects of using methanol and ethanol fuels, both straight and in blends, in various engine technologies are discussed.

32513 (UCRL—52841(Vol.1)) **Energy storage systems for automobile propulsion: 1979 study. Volume 1. Overview and findings.** Forsberg, H.C.; Anderson, C.J.; Behrin, E. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 15 Dec 1979. Contract W-7405-ENG-48. 93p. NTIS, PC A05/MF A01.

Technical and cost analyses of energy-storage devices and propulsion systems for automobiles were conducted. Study panels examined electrochemical, mechanical, and chemical/thermal storage devices, selected the most promising ones, and projected their characteristics into three time frames through 2000. The Automotive End-Use Panel modeled these devices and propulsion systems as vehicles of several sizes and performance levels and prepared comparative evaluations between systems and with projected baseline internal-combustion-engine vehicles.

TURBINE

32514 (AD-A—076257) **Probe effects in gas turbine combustor emissions measurements. Final report 1 Mar—1 Oct 78.** Clark, J.A.; Peters, J.E.; Mellor, A.M. (Dayton Univ., OH (USA)). Jun 1979. Contract F33615-77-C-2069. 61p. NTIS, PC A04/MF A01.

Four geometrically distinct, stainless steel probes are used to study the concentrations of CO, HC_n, NO, and NOX at several different radial and two different axial positions within a simplified gas turbine combustor. The probes are all water cooled but do not employ an aerodynamic quench. They are designed to assess the effect of tip shape, tip to body proximity, and probe entry point on measured pollutant concentrations. Though probe entry point and tip to body proximity are shown to imperceptibly affect the pollutant concentrations, probe tip geometry has a marked impact on the measured pollutant levels. Specifically, the aerodynamic, tapered-tip probe yields depressed CO and HC, and elevated NO concetrations compared to other three blunt-tipped probes. Regarding reproducibility, the pollutant concentratins measured with one of the blunt-tipped probes in this study are compared to pollutant levels measured with the same probe three years ago Tuttle, et al. 1975). CO and HC are shown to be the most reproducible species, while NO and NOX acceptably but less accurately agree with past studies.

EXTERNAL COMBUSTION ENGINES

STIRLING CYCLE

32515 (DOE/NASA/0032—80/7) **Automotive Stirling Engine Development Program. Technical progress report for period January 1-March 29, 1980.** (Mechanical Technology, Inc., Latham, NY (USA). Stirling Engine Systems Div.). Jun 1980. Contract AI01-77CS51040. 102p. (NASA-CR—159851; MTI—80ASE129AT8). NTIS, PC A06/MF A01.

The activities performed on the Stirling Reference Engine System Design; components and subsystems; P-40 baseline Stirling engine installation and test; the first automotive engine to be built on the program; computer development activities; and technical assistance to the Government are summarized. The overall program philosophy is outlined, and data and results are given.

32516 (DOE/NASA/4396—4) **Automotive Stirling Engine Development Program.** Kitzner, E.W. (Ford Motor Co., Dearborn, MI (USA)). Mar 1980. Contract AC02-77CS54396; AI01-77CS51040. 439p. (NASA-CR—159836). NTIS, PC A19/MF A01.

The Task I accomplishments of the jointly funded Ford/DOE Automotive Stirling Engine Development Program are detailed. This task was directed at achieving 20.6 MPG (gasoline) fuel economy for a 4500 lb inertia weight Stirling engine-powered passenger car. The results of engine testing and design, power control, fuel economy projections, and component design and development are discussed.

ELECTRIC-POWERED SYSTEMS

REFER ALSO TO CITATION(S) 32346, 32513

32517 (JPL-PUBL—79-115) **Assessment of inductive coupling roadway powered vehicles.** Leschly, K.O.; Feinberg, A.; Heft, R.; Warren, G. (Jet Propulsion Lab., Pasadena, CA (USA)). 15 Apr 1980. Contract AI01-78CS54209. 263p. NTIS, PC A12/MF A01.

The technical concept underlying the roadway powered vehicle system is the combination of an electrical power source embedded in the roadway and a vehicle-mounted power pickup that is inductively coupled to the roadway power source. The study investigates the feasibility of such a system, implemented on a large scale. Factors considered included current and potential transportation modes and requirements, economics, energy, technology, social and institutional issues. These factors interrelate in highly complex ways, and firm understanding of each of them does not yet exist. The study therefore was structured to manipulate known data in equally complex ways to produce a schema of options and useful questions that can form a basis for further, harder research. A dialectical inquiry technique was used in which two adversary teams, mediated by a third-party team, debated each factor and its interrelationship with the whole of the known information on the topic.

HYBRID SYSTEMS

REFER ALSO TO CITATION(S) 32431

FLYWHEEL PROPULSION

REFER ALSO TO CITATION(S) 32513, 32602

VEHICLE DESIGN FACTORS

ENGINE-TRANSMISSION MATCHING

32518 (DOE/NASA/1024—1) **Small passenger car transmission test: Chevrolet 200 transmission.** Bujold, M.P. (Eaton Corp., Southfield, MI (USA). Engineering and Research Center). Mar 1980. Contract AI01-77CS51044. 382p. (NASA-CR—159835; ERC-LIB—79168). NTIS, PC A17/MF A01.

The small passenger car transmission test was initiated to supply electric vehicle manufacturers with technical information regarding the performance of commercially available transmissions. This information would enable EV manufacturers to design a more energy efficient vehicle. With this information the manufacturers would be able to estimate vehicle driving range as well as speed and torque requirements for specific road load performance characteristics. This report covers the testing of a 1979 Chevrolet Model 200 automation transmission. This transmission was tested per a passenger car automatic transmission test code (SAE J651b) which required drive performance, coast performance, and no load test conditions. Under these test conditions, the transmission attained maximum efficiencies in the mid-eighty percent range for both drive performance tests and coast performance tests. The major results of this test are the torque, speed, and efficiency curves which are reported in the data section. These graphs map the complete performance characteristics for the Chevrolet Model 200 transmission.

EMISSION CONTROL

REFER ALSO TO CITATION(S) 32514, 32712

HYDROCARBONS

32519 (TRW—32512-6002-RU-00) **Wall quench and flammability limit effects on exhaust hydrocarbon emissions. Phase 4. Final technical report, 1 August 1979-30 June 1980.** Fendell, F.E. (TRW Defense and Space Systems Group, Redondo Beach, CA (USA). Engineering Sciences Lab.). Jun 1980. Contract AC03-78ET13329. 42p. NTIS, PC A03/MF A01.

Progress is reported in studies of the generation and fate of unburned carbons emitted by automotive engines. Both numerical simulation and laser-Raman-spectroscopy are being used to obtain quantitative data. In general, these investigations involve thin layers near the cylinder walls and piston crown, and flame-wall interaction, although some bulk-gas phenomena during combustion are also being examined. Currently, the relative contribution of wall quench, of nonpropagation of flame into small crevices (such as that near the top land area of the piston crown), and of absorption/desorption of hydrocarbon vapors by the thin motor-oil film coating side walls is being examined, but results are not yet definitive. Clearly, choice among a multiplicity of engine-design alternatives is uncertain while the major parameters controlling generation and persistence of unburned hydrocarbons remain unidentified. One specific practical innovation being examined is the use of ceramic-capped cylinder components in place of conventional metallic-alloy components. Adoption of lower-heat-transfer, higher-wall-temperature materials might obviate the unburned-hydrocarbon difficulty, as well as reduce size and weight and maintenance and reliability and parasitic-power-loss liabilities of current air-and-water-cooled engines. Furthermore, for larger vehicles such as trucks, engine compounding to exploit the hotter exhaust from the primary engine may lead to greater thermal efficiency. However, increased tendency to knock, reduced volumetric efficiency, and uncertain integrity of the ceramic under mechanical stress and thermal shock are difficulties encountered by this approach.

ALTERNATIVE FUELS

REFER ALSO TO CITATION(S) 32418

32520 (AD-A—076145) **Laboratory investigation of the performance of a Holden engine operating on liquified petroleum gas.** Webb, N. (Engineering Development Establishment, Maribyrnong (Australia)). Aug 1979. 49p. NTIS, PC A03/MF A01.

A laboratory investigation into the relative performances of an engine when operated on both liquified petroleum gas (LPG) and petrol showed that the engine operated at higher termal efficiency on LPG and also that it would operate satisfactorily at leaner air-fuel mixtures on this fuel. Engine performance was less affected by retarded ignition for LPG than for petrol. Furthermore a large increase in dwell angle from the recommended setting had no significant effect on LPG performance. The LPG carburettor when installed in its normal configuration maintained an essentially constant mixture strength with no part throttle leaning of mixtures to give better efficiency nor corresponding full throttle enrichment to give best engine torque.

MATERIALS

REFER ALSO TO CITATION(S) 31470, 31476

32521 **Amorphous and liquid semiconductors.** Paul, W.; Kastner, M. (eds.). Contract AP02-79ER10449. Amsterdam, NE; North-Holland Publishing Co. (1980). 642p. (DOE/ER/10449—1; CONF-790851—(Pt.1)).

From 8. international conference on amorphous and liquid semiconductors; Cambridge, MA, USA (27 Aug 1979).

Separate abstracts have been prepared for papers within the scope of the energy data base.

METALS AND ALLOYS

REFER ALSO TO CITATION(S) 31463, 31467, 31468, 32494

PREPARATION AND FABRICATION

REFER ALSO TO CITATION(S) 31462, 32578

32522 (BNL—28150) **Metallurgy of continuous filamentary A15 superconductors.** Suenaga, M. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 136p. (CONF-800839—1). NTIS, PC A07/MF A01.

From NATO advanced study institute superconducting materials-science and technology; Lisbon, Portugal (19 Aug 1980).

The early history of the bronze process is recapitulated and modifications to the process which have since followed are described. The metallurgical principles, which are involved in the process, are described including the kinetics of the compound growth, the effects of additives on the growth, etc. The superconducting properties of these compounds are also discussed. The influence of metallurgical variables on the superconducting properties is discussed in detail. In discussing the superconducting current densities in these compounds, limits in applicability of existing magnetic-flux-pinning models are also treated as well as methods for determining critical magnetic fields.

32523 (EMD—80-63(Vol.1)) **Domestic aluminum resources: dilemmas of development.** Staats, E.B. (General Accounting Office, Washington, DC (USA)). 17 Jul 1980. 147p. GPO.

Report to the Congress by the Comptroller General of the United States.

Concerns about supply disruptions and price gouging that could endanger aluminum production in the United States have spurred research in this country on processes to manufacture aluminum from ores other than bauxite. The United States has no large

bauxite deposits but it has plentiful resources of other aluminum ores if the technology can be developed to use them economically. Sources of aluminium include alunite, anorthosite, dawsonite, and clay/acid. Miniplants for clay/nitric acid and clay/hydrochloric acid, gas-induced crystallization have been constructed.

32524 (EMD—80-63(Vol.2)) **Domestic aluminum resources: dilemmas of development. Volume II. Appendixes II-VII: detailed agency comments and GAO response.** Staats, E.B. (General Accounting Office, Washington, DC (USA)). 17 Jul 1980. 99p. GPO.

Report to the Congress by the Comptroller General of the United States.

Comments by other agencies on the Report to Congress on aluminium production from nonbauxite ores are given. (FS)

32525 (GEPP-TIS—510) **Effect of surface treatment on strength of molybdenum/glass-ceramic seal in a vacuum tube.** Spears, R.K. (General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.). 25 Aug 1980. Contract AC04-76DP00656. 60p. NTIS, PC A04/MF A01.

The benefits of etching molybdenum frames prior to sealing a glass-ceramic insulator to the frames was studied. The following etchants were examined: (1) concentrated acid, (2) diluted acid, (3) chromic-acid and (4) chromic-acid dipped followed by nickel plating (the control sample). The axial compression test load and the quantity of ultrasonic defects were used as a measure of quality. It was found that, between the three parameters and the control, there was not a significant difference as determined by the Mann-Whitney analysis of variance. The day-to-day variation in compression strength and ultrasonic defects of these test frames was also studied. Except for the fact that there were substantially more ultrasonic defects on the first day, there appeared to be no other indications that the day the parts were sealed was a significant factor. The effect of position in the sealing furnace was also examined. Generally, there were more ultrasonic defects and a lower axial compression test load for the parts sealed in the lower portions of the two 5-part stacks than near the top of each stack. There was no substantial difference between axial compression test results between the top and bottom stacks. When comparing sealing position, there appeared to be a positive correlation between ultrasonic defects and axial compression test results.

32526 (SAND—80-6011) **Process for increasing the reaction rate in aluminothermic reactions, particularly in their welding applications.** Goldschmidt, A.G. 21 Jun 1980. Translation of . French Patent 705,569. 6p. NTIS, PC A02/MF A01.

A process is described for increasing the reaction rate in aluminothermic operations, in particular applied to welding. A process is characterized by the fact that an alloy of aluminum and small quantities of metals or metalloids are prepared which have an affinity for oxygen that is greater than that of aluminum, such as calcium, magnesium, sodium, etc. These metals are added to the aluminum individually or in groups of several metals combined, in quantities of a few percent.

32527 **New class of layered materials.** Schuller, I.K. (Solid State Science Division, Argonne National Laboratory, Argonne, Illinois 60439). *Phys. Rev. Lett.;* **44**: No. 24, 1597-1600(16 Jun 1980).

A new class of layered materials has been prepared by alternate deposition of two dissimilar metals. Strong experimental evidence is shown that coherent structures with layer thicknesses approaching interatomic spacing can be prepared in this fashion. The experimental x-ray measurements are found to be in good qualitative and quantitative agreement with model calculations.

STRUCTURE AND PHASE STUDIES

REFER ALSO TO CITATION(S) 32547, 32561, 32576

32528 **Effect of the second phase morphology on the mechanical properties of dual phase Fe/Si/C steels.** Kim, N.J.; Thomas, G. Contract W-7405-ENG-48. Berkeley, CA; Univ. of California ([nd]). 129-130p.

An investigation has been made into the effects of the second phase morphology on the mechanical properties of dual phase Fe/Si/C steels. A coarse dual phase structure which was obtained by continuously annealing in the two phase range from the austenite range resulted in very poor ductility. In this case, a premature failure occurs by the initiation of cracks in the ferrite region where maximum localized stress concentration takes place. However, upon obtaining fine, fibrous dual phase structures or fine, globular dual phase structure by respectively annealing the martensitic and hypoeutectoid structure in the two phase range, there was a significant improvement in ductility without much decrease in strength and no evidence of premature crack formation was found in either case.

32529 **Observations of the prevacancy temperature dependence of positron annihilation in copper.** Smedskjaer, L.C.; Fluss, M.J.; Siegel, R.W.; Chason, M.K.; Legnini, D.G. (Argonne National Lab., IL (USA)). *J. Phys., F (London);* **10**: No. 4, 559-569(Apr 1980).

The temperature dependence of the Doppler-broadening lineshape parameter has been studied for Cu in the temperature range 30 to 1040°C, with special attention given to the prevacancy region (T < 500°C). Effects attributable to positron trapping were observed in the prevacancy region for samples annealed at temperatures T =< 950°C. Measurements at T > 500°C allowed a quantitative comparison to be made between the prevacancy traps and thermally generated vacancies. This comparison permitted a determination of both the fraction of positrons trapped in the prevacancy region and the lineshape parameter characteristic of annihilation in the prevacancy traps. It was found that the fraction of positrons trapped in the prevacancy temperature region depends upon the thermal and mechanical history of the sample, and possibly also on its impurity content. In addition, two possible explanations of the prevacancy trapping are discussed.

32530 **Superconducting critical currents for thick, clean superconductor—normal-metal—superconductor junctions.** Hsiang, T.Y.; Finnemore, D.K. (Ames Laboratory, U.S. Department of Energy and Department of Physics, Iowa State University, Ames, Iowa 50011). *Phys. Rev., B: Condens. Matter;* **22**: No. 1, 154-163(1 Jul 1980).

Superconducting critical currents have been studied for superconductor—normal-metal—superconductor S-N-S junctions as a function of temperature, magnetic field, and thickness in order to determine the spatial variation of the superconducting pair potential in the normal-metal region. Emphasis is placed on the thick, clean limit for the normal metal. The temperature dependence of J/sub c/ obeys predictions based on the de Gennes-Werthamer theory, and the magnitude of J/sub c/ is reasonable. In a high magnetic field, J/sub c/ falls exponentially with increasing magnetic field, indicating that the inverse of the decay length of the order parameter, K^-1/sub N/, is approximately linear in H.

32531 **Addition of Mn and Al to the hydriding compound FeTi: range of homogeneity and lattice parameters.** Dew-Hughes, D. (Brookhaven National Lab., Upton, NY). *Metall. Trans.;* **11a**: No. 7, 1219-1225(Jul 1980).

Isothermal sections, at 1000°C, of the Ti-rich corners of the Mn-Fe-Ti and Al-Fe-Ti ternary phase diagrams have been determined. Particular attention has been paid to the FeTi hydriding compound. Mn and Al both substitute for Fe in the compound; the former up to 27 at. pct, the latter up to 24 at. pct. Analysis of the lattice parameter data suggest that effective atomic radii, in the B2 structure, are Al: 1.38A, Fe: 1.18A, Mn: 1.22A, and Ti: 1.40A.

32532 **Observation of a charge-density wave in α-U at low temperature.** Smith, H.G.; Wakabayashi, N.; Crummett, W.P.; Nicklow, R.M.; Lander, G.H.; Fisher, E.S. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). W-7405-ENG-26. *Phys. Rev. Lett.;* **44**: No. 24, 1612-1615(16 Jun 1980).

We report the discovery of a charge-density wave (CDW) in α-U at ~ 43 K. The mode corresponds to the condensation of a longitudinal-optic phonon near q=1/2,0,0] in which the atoms are displaced by ~ 0.006 A from their special positions. Large precursor effects are seen in the phonon spectra. The wave vector of the CDW is related to that of the fundamental lattice in a rather complex way, which is discussed in terms of discommensurations between the CDW (α′ phase) and the primary α-phase.

32533 **Temperature dependence of the positron annihilation characteristics in molybdenum containing voids.** Schultz, P.J.; Lynn, K.G.; MacKenzie, I.K.; Jean, Y.C.; Snead, C.L. Jr. (Brookhaven National Laboratory, Upton, New York 11973). *Phys. Rev. Lett.;* **44**: No. 24, 1629-1632(16 Jun 1980).

For neutron-irradiated Mo containing voids, a temperature dependence of the positron trapping intensity is observed between 9 and 400 K. Shallow traps are responsible and have an activation energy of 0.1 +- 0.05 eV. Deep microstructural traps are identified as small loops with dislocation tangles presumed to be the shallow traps. Evidence of positronium formation in the voids at high temperature is presented.

32534 **Growth morphology and defects in plasma-deposited a-Si:H films.** Knights, J.C. (Xerox Palo Alto Research Center, Palo Alto, CA). Contract 03-79-ET-23033. *J. Non-Cryst. Solids;* **35 & 36**: 159-170(1980). (DOE/ER/10449—1; CONF-790851—(Pt.1)).

From 8. international conference on amorphous and liquid semiconductors; Cambridge, MA, USA (27 Aug 1979).

Structural studies of plasma-deposited a-Si:H are presented that show that a major class of defect is an anisotropic density fluctuation. Studies of the hydrogen environment suggest that an inhomogenous hydrogen distribution is associated with these fluctuations. From considerations of the deposition chemistry and nucleation theory a model is proposed to describe the film growth process and its relationship to defects.

32535 Retarding crystallization of CVD amorphous silicon by alloying. Booth, D.C.; Allred, D.D.; Seraphin, B.O. (Univ. of Arizona, Tucson). Contract ER-78-S-02-4899. *J. Non-Cryst. Solids;* **35 & 36**: 213-218(1980). (DOE/ER/10449—1; CONF-790851—(Pt.1)).

From 8. international conference on amorphous and liquid semiconductors; Cambridge, MA, USA (27 Aug 1979).

Amorphous silicon holds considerable promise as a photothermal absorber, but high-temperature-induced crystallization limits its usefulness. To attempt to retard the crystallization, we produced CVD a-Si films alloyed with C, N, B, or Ge. These films crystallized differently than did the non-intentionally doped amorphous material. The crystallization temperature was increased from 680°C to 950°C for 18 at.% C-alloyed a-Si, and even then more than 10 hours were required for crystallization. This retardation of crystallization gives alloyed a-Si absorbers sufficient life expectancy for converters operating at temperatures up to 700°C.

32536 Structure and defects in the amorphous Si:As:H system. Nemanich, R.J.; Knights, J.C. (Xerox Palo Alto Research Center, Palo Alto, CA). Contract 03-79-ET-23033. *J. Non-Cryst. Solids;* **35 & 36**: 243-248(1980). (DOE/ER/10449—1; CONF-790851—(Pt.1)).

From 8. international conference on amorphous and liquid semiconductors; Cambridge, MA, USA (27 Aug 1979).

Raman and ESR measurements were used to study the atomic bonding and defect concentrations. Features are identified in the Raman spectra which can be attributed to configurations containing Si-Si, Si-As and As-As bonds. Features due to all three of these configurations were found to simultaneously exist, thus excluding a chemically ordered model of the bonding. However, the composition dependences of the features do not follow exactly a random bonding model either. The H bonding configurations were reflected in features at ~2000 cm^{-1} in the Raman spectra. It was found that the H bonding changed dramatically in the As doping to 5% As alloying region. The ESR measurements indicated a low level of singly occupied defect states in all the samples studied.

32537 Defect creation and hydrogen evolution in amorphous Si:H. Biegelsen, D.K.; Street, R.A.; Tsai, C.C.; Knights, J.C. (Xerox Palo Alto Research Center, CA). Contract 03-79-ET-23033. *J. Non-Cryst. Solids;* **35 & 36**: 285-290(1980). (DOE/ER/10449—1; CONF-790851—(Pt.1)).

From 8. international conference on amorphous and liquid semiconductors; Cambridge, MA, USA (27 Aug 1979).

The origin and nature of electrically active defects created by annealing are studied by luminescence, electron spin resonance, infrared absorption and hydrogen manometry. The initial defect density decreases similarly for all samples in annealing to ~250°C. The temperature dependence of the subsequent increase in defect density is dominated by the effects of diffusion and sample microstructure and depends only indirectly on hydrogen bonding configurations. The peak in the rate of hydrogen evolution near 420°C is assigned to immediate release from isolated $=SiH$ and/or $=SiH_2$ sites; this peak is found to shift to > 700°C because of diffusive delays in thick, homogeneous samples. Peaks at temperatures below 420°C are ascribed to hydrogen bonding sites on or near microstructural surfaces.

32538 Atom probe FIM investigation of voids in a-Ge. Krishnaswamy, S.V.; Messier, R.; Ng, Y.S.; Tsong, T.T.; McLane, S.B. (Pennsylvania State Univ., University Park). Contract EM-78-C-04-5302. *J. Non-Cryst. Solids;* **35 & 36**: 531-536(1980). (DOE/ER/10449—1; CONF-790851—(Pt.1)).

From 8. international conference on amorphous and liquid semiconductors; Cambridge, MA, USA (27 Aug 1979).

The direct observation is reported on an atomic scale, of the void network structure in a-Ge and a-Ge:H thin films. Using an atom probe field ion microscope (APFIM) we are able to study the structure and composition of Ge films rf-sputtered onto Mo FIM tips at various conditions. The voids are highly aligned perpendicular to the tip-film interface and extend through the entire film. The void size varies from 50-300A and decreases with increasing rf-power level. The void density is on the order of 10^{11} voids/cm^2. Local ordering and clustering are observed at the interface as well as in the bulk of the film.

32539 Diamond-like 3-fold coordinated amorphous carbon. Wada, N.; Gaczi, P.J.; Solin, S.A. (Univ. of Chicago, IL). *J. Non-Cryst. Solids;* **35 & 36**: 543-548(1980). (DOE/ER/10449—1; CONF-790851—(Pt.1)).

From 8. international conference on amorphous and liquid semiconductors; Cambridge, MA, USA (27 Aug 1979).

Evaporated and sputtered a-C films deposited at L.N. temperature were prepared and studied as a function of annealing using Raman, electron energy loss, and ESR techniques. The reduced Raman spectra of virgin films reflect the one phonon density of states of graphite. Moreover, no evidence for diamond bonding is found from the electron energy loss experiment. Upon annealing, graphitic structural correlations develop within bounded islands of carbon atoms. This picture is consistent with ESR measurements which yield 3 x 10^{19} spins/cm^3 independent of annealing but a resonance line (g=2.002 +- .0005) that narrows with annealing. A model based solely on a three-fold coordinated random network structure will be presented to explain the diamond-like physical properties of a-C films and their changes with annealing.

32540 Crystal data for room temperature PuGa. Roof, R.B. (Los Alamos Scientific Lab., NM (USA)). *J. Appl. Crystallogr.;* **12**: No. 6, 619-621(1 Dec 1979).

The structure of room temperature PuGa has been determined. The material has a body-centered tetragonal lattice, space group I4mm (No. 107), Z = 8, a = 6.6408 +- 12, c = 8.0833 +20 A, and a calculated density of 11.50 Mg m^{-3}. Intensity data was obtained from a powder-pattern film taken with Cr Kα radiation, lambda = 2.2909 A. The structure, which deviates slightly from an ideal subcell, was refined by least-squares calculation to $R_1 = 0.079$ using 39 observed reflections. Pu-Pu distances range from 3.08 to 3.40 A, Pu-Ga distances from 3.07 t 3.26 A, and Ga-Ga distances from 2.75 to 3.89 A.

32541 Crystal structure of zeta-$Pu_{19}Os$, a structure closely related to β-Pu. Cromer, D.T. (Los Alamos Scientific Lab., NM (USA)). *Acta Crystallogr., Sect. B;* **35**: No. 9, 1945-1949(15 Sep 1979).

The structure of zeta-Pu-Os, the high-temperature phase of approximate composition $Pu_{19}Os$, has been solved by single-crystal methods and refined by full-matrix least squares. Data were collected with an automated Picker diffractometer. The crystals are orthorhombic, space group Pnna, with a=15.839(5), b=7.819(3), c=9.151(3) A and there are 52 atoms in the unit cell. The Os atoms substitute randomly in one or more of the Pu sites. The eight kinds of Pu atoms have from 12 to 15 neighbors at distances ranging from 2.51 to 3.85 A. The structure is closely related to that of β-Pu and also has a feature in common with zeta-$Pu_{19}Zr$. The common features of these three structures are discussed. The average valence of Pu in the phase is 5.4, the same as that in β-Pu. For 1110 observed reflections R=0.072 and Rsub(w)=0.068.

MECHANICAL PROPERTIES

REFER ALSO TO CITATION(S) 32270, 32528

32542 (AD-A—076038/9) Development of low alloy ti-b steels for high temperature service applications. Technical report. Piekutowski, M.A. (Cornell Aeronautical Lab., Inc., Buffalo, NY (USA)). Apr 1952. Contract W33-038-AC-21094. 79p. NTIS, PC A05/MF A01.

Conservation of strategic metals may be accomplished in the production of jet aircraft engine parts provided suitable lean alloy substitutes are made available, capable of operating at elevated temperatures. In this respect, the Ti-B type of ferritic steels have been investigated and their creep and rupture properties evaluated and improved for service temperatures in the neighborhood of 1200 degrees F. It was demonstrated, through testing the properties of a 600 pound heat of 3 Cr- 1 Mo-Ti-B sheet steel with a 2.2 Ti/C ratio, that such a composition not only could be steel mill processed satisfactorily on a semi-commercial basis, but also that 1200 degrees F rupture and creep strength properties equivalent to the Cr-Ni stainless steels, could be obtained for several hundred hours of life. A detailed investigation of this steel provided design type creep data for several conditions of heat treatment and hot rolling procedures. Other tests indicated that high hot strength properties could be retained in light gage sheet material provided surface decarburization was minimized during processing. Ceramic coated creep and rupture test specimens of this alloy displayed a life advantage over uncoated specimens at temperatures above 1200 degrees F because of protection against oxidation. Heliarc welded joints of the 3 Cr- 1 Mo-Ti-B sheet steel had inferior hot rupture strength with respect to the parent metal when no filler rod was used. A reasonable approach to parent metal high temperature strengths was obtained with the use of a 347 stainless steel filler rod with the weld bead left on.

32543 (ANL—80-45) Low-frequency fatigue-crack propagation in Type 304 stainless steel at 482 and 593°C. Raske, D.T. (Argonne National Lab., IL (USA)). Jun 1980. Contract W-31-109-ENG-38. 24p. NTIS, PC A02/MF A01.

This report presents results from an investigation on the low-frequency fatigue-crack growth behavior of Type 304 stainless steel at 482 and 593°C. Included were continuous-cycling tests with a triangular loading waveform, waveshape-effects tests employing slow-fast, fast-slow and square waveforms, creep-crack growth rate tests, and a block-loading test. The results are compared with similar test data from the literature, and the block-loading test results are compared with results predicted by integrating the relations for da/dN obtained under constant conditions.

32544 (CONF-800741—1) Creep-fatigue effects in structural materials used in advanced nuclear power generating systems. Brinkman,

C.R. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 23p. NTIS, PC A02/MF A01.

From 27. sagamore army materials research conference; Bolton Landing, NY, USA (14 Jul 1980).

Various aspects of time-dependent fatigue behavior of a number of structural alloys in use or planned for use in advanced nuclear power generating systems are reviewed. Materials included are types 304 and 316 stainless steel, Fe-2 1/4 Cr-1 Mo steel, and alloy 800H. Examples of environmental effects, including both chemical and physical interaction, are presented for a number of environments. The environments discussed are high-purity liquid sodium, high vacuum, air, impure helium, and irradiation damage, including internal helium bubble generation.

32545 (DOE/ID/01570—T10) **Mechanical properties test data for structural materials. Semiannual progress report for period ending July 31, 1980.** Keiser, D.D. (EG and G Idaho, Inc., Idaho Falls (USA)). 1980. Contract AC07-76ID01570. 35p. NTIS, PC A03/MF A01.

Mechanical property investigations of Alloy 718 given either the 954°C conventional or the INEL heat treatment are continuing. Current conventional heat-treat data include tests showing the effects of surface finish, product variability, and thermal exposure on the high-cycle fatigue properties; creep-fatigue tests at 538, 593, 649, and 704°C with 0.1 hour hold times at peak strain; and stress-rupture tests of notched and smooth specimens showing the effect of pretest thermal exposure. A few stress-rupture tests of weld and base metals given the INEL heat treatment are also reported. High-cycle fatigue tests of Type 316 stainless steel at 593°C are reported and compared with previous data from other sources.

32546 (DP-MS—80-19) **Fractography of hydrogen-embrittled iron-chromium-nickel alloys.** Caskey, G.R. Jr. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1980. Contract AC09-76SR00001. 17p. (CONF-800833—2). NTIS, PC A02/MF A01.

From 13. annual technical meeting of the International Metallographic Society; Brighton, UK (18 Aug 1980).

Tensile specimens of iron-chromium-nickel base alloys were broken in either a hydrogen environment or in air following thermal charging with hydrogen. Fracture surfaces were examined by scanning electron microscopy. Fracture morphology of hydrogen-embrittled specimens was characterized by: changed dimple size, twin-boundary parting, transgranular cleavage, and intergranular separation. The nature and extent of the fracture mode changes induced by hydrogen varied systematically with alloy composition and test temperature. Initial microstructure developed during deformation processing and heat treating had a secondary influence on fracture mode.

32547 (EGG-FM—5160) **Ultrasonic properties of austenitic stainless steel welds.** Lott, L.A. (EG and G Idaho, Inc., Idaho Falls (USA)). May 1980. Contract AC07-76ID01570. 35p. NTIS, PC A03/MF A01.

Measurements of ultrasonic velocity and attenuation were made on welded austenitic stainless steel specimens, and data correlated to flaw detectability. Measurements were made at 2.25 MHz for both longitudinal and shear waves as functions of propagation and polarization directions. The results of ultrasonic velocity measurements show that, in stainless steel welds, a high degree of anisotropy exists with respect to ultrasonic wave propagation: for different propagation and polarization directions, shear wave velocities varied from 2.8 to 4.2 mm/μs compared to 3.1 mm μs for base material, and longitudinal wave velocities varied from 5.5 to 6.0 mm/μs compared to 5.9 mm μs for base material. Measurements of reflected signals from simulated defects in a welded stainless steel plate indicate that, for 45-degree angle beams, longitudinal waves exhibit larger signal-to-noise ratios than shear waves. Horizontally polarized shear waves exhibit larger signal-to-noise ratios than shear waves. Horizontally polarized shear waves exhibit larger signal-to-noise ratios than commonly used vertically polarized shear waves at 45-degrees. These results have potential significance for practical ultrasonic examination of welded stainless steel structures.

32548 (HEDL-SA—2101-FP) **Mechanical model for ductility loss.** Hu, W.L. (Hanford Engineering Development Lab., Richland, WA (USA)). 11 Feb 1980. Contract AC14-76FF02170. 24p. (CONF-800673—2). NTIS, PC A02/MF A01.

From 13. national symposium on fracture mechanics; Philadelphia, PA, USA (8 Jun 1980).

A mechanical model was constructed to probe into the mechanism of ductility loss. Fracture criterion based on critical localized deformation was undertaken. Two microstructure variables were considered in the model. Namely, the strength ratio of grain boundary affected area to the matrix, Ω, and the linear fraction, x, of grain boundary affected area. A parametrical study was carried out. The study shows that the ductility is very sensitive to those microstructure parameters. The functional dependence of ductility to temperature as well as strain-rate, suggested by the model, is demonstrated to be consistent with the observation.

32549 **Effect of hydrostatic pressure on the elastic constants of pure and hydrogenated single crystals of V and $Nb_{53}Ta_{47}$.** Alberts, H.L.; Fisher, E.S. (Argonne National Lab., IL (USA)); Katahara, K.W.; Manghnani, M.H. *J. Phys., F (London);* **9**: No. 11, L209-L213(Nov 1979).

Measurements of the effect of pressure on the elastic constants of pure and hydrogenated single crystals of V and $Nb_{53}Ta_{47}$ are reported. For both samples dC'/dP was found to decrease when hydrogen was added. The qualitative features of this behaviour can be explained by the proposal that an increase occurs in the tetragonal distortion around the H interstitial when the atomic volume decreases.

32550 (SAND—80-0779C) **Sb interactions with TaC precipitates and Cu in ion-implanted α-Fe.** Follstaedt, D.M.; Myers, S.M. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 28p. (CONF-800744—3). NTIS, PC A03/MF A01.

From Ion beam modification of materials conference; Albany, NY, USA (14 Jul 1980).

The interactions of Sb with the other species implanted into Fe to form Fe-Ta-C-Sb and Fe-Cu-Sb alloys have been examined with transmission electron microscopy and Rutherford backscattering following annealing at 873°K. Trapping of Sb at TaC precipitates is observed in the former alloy just as was previously observed in Fe-Ti-C-Sb. In Fe-Cu-Sb, Sb interactions are governed by the atomic ratio of Sb to Cu. For ratios between 0.2 to 0.4, the compound β-Cu_3Sb was observed to form. For Sb to Cu ratios $\sim < 0.1$, fcc Cu precipitates were observed. In addition to the expected Sb dissolution in Cu, Sb trapping by Cu precipitates is also observed. The binding enthalpy of Sb at both TaC and Cu precipitates with respect to a solution site in the bcc Fe is the same as observed for TiC, $\sim$ 0.4 eV. The constancy of the binding enthalpy at such chemically dissimilar precipitates supports the hypothesis that the trapping is due to the structural discontinuity of the precipitate-host interface. The observed Sb trapping at precipitates is of potential significance for the control of temper embrittlement in bcc steels.

32551 (SAND—80-1300C) **Determination of the shear strength of shock compressed 6061-T6 aluminum.** Asay, J.R.; Chhabildas, L.C. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 15p. (CONF-800641—6). NTIS, PC A02/MF A01.

From International conference on the metallurgical effects of high strain rate deformation and fabrication; Albuquerque, NM, USA (22 Jun 1980).

The strength of 6061-T6 aluminum was assessed over the stress range of 8-40 GPa using velocity interferometry to measure reloading and unloading profiles from the initial shocked state. These results show that the shear stress which can be supported in the shocked state increases by about a factor of five over this range. This observation is in agreement with previous investigations. However, an important new observation is that a substantial increase in shear stress occurs during reloading, resulting in a well-defined elastic precursor. This result indicates a significant departure from the elastic-plastic model and suggests that softening occurs during initial shock compression.

32552 (UCRL—83986) **Liquid-metal embrittlement of refractory metals by molten plutonium.** Lesuer, D.R.; Bergin, J.B.; McInturff, S.A.; Kuhn, B.A. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). Jul 1980. Contract W-7405-ENG-48. 26p. (CONF-800833—1). NTIS, PC A03/MF A01.

From 13. annual technical meeting of the International Metallographic Society; Brighton, UK (18 Aug 1980).

Embrittlement by molten plutonium of the refractory metals and alloys W-25 wt % Re, tantalum, molybdenum, and Ta-10 wt % W was studied. At 900°C and a strain rate of 10^{-4} s^{-1}, the materials tested may be ranked in order of decreasing susceptibility to liquid-plutonium embrittlement as follows: molybdenum, W-25 wt % Re, Ta-10 wt % W, and tantalum. These materials exhibited a wide range in susceptibility. Embrittlement was found to exhibit a high degree of temperature and strain-rate dependence, and we present arguments that strongly support a stress-assisted, intergranular, liquid-metal corrosion mechanism. We also believe microstructure plays a key role in the extent of embrittlement. In the case of W-25 wt % Re, we have determined that a dealloying corrosion takes place in which rhenium is selectively withdrawn from the alloy.

32553 **Use of a boron addition to prevent intergranular embrittlement in Fe-12Mn.** Hwang, S.K.; Morris, J.W. Jr. *Metall. Trans.;* **11a**: No. 7, 1197-1218(Jul 1980).

Fe-12 Mn alloys undergo failure by catastrophic intergranular fracture when tested at low temperature in the as-austenitized condition, a consideration which prevents their use for structural applications at cryogenic temperatures. The present research was undertaken to identify modifications in alloy composition or heat treatment

which would suppress this embrittlement. Chemical and microstructural analyses were made on the prior austenite grain boundaries within the alloy in its embrittled state. These studies failed to reveal a chemical or microstructural source for the brittleness, suggesting that intergranular brittleness is inherent to the alloy in the as-austenitized condition. The addition of 0.002 to 0.01 wt pct boron successfully prevented intergranular fracture, leading to a spectacular improvement in the low temperature impact toughness of the alloy. Autoradiographic studies suggest that boron segregates to the austenite grain boundaries during annealing at temperatures near 1000°C. The cryogenic toughness of a Fe-12Mn-0.002B alloy could be further improved by suitable tempering treatments. However, the alloy embrittled if inappropriate tempering temperatures were used. This temper embrittlement was concomitant with the dissolution of boron from the prior austenite grain boundaries, which reestablishes the intergranular fracture mode.

32554 Effect of hydrogen on the mechanical properties of iron whiskers. Lee, K.S. (Brookhaven National Lab., Upton, NY); Dew-Hughes, D. *Metall. Trans.;* **11a**: No. 7, 1227-122(Jul 1980).

The effect of H on the mechanical properties of Fe whiskers was studied. Single crystal whiskers of iron were grown by H reduction of ferrous chloride. It is concluded that the presence of H has no significant effect upon the mechanical properties of Fe single crystal whiskers. (FS)

32555 Effects of notches on crack initiation in low-cycle fatigue. Maiya, P.S. (Argonne National Lab., IL). *Mater. Sci. Eng.;* **38**: 289-294(1979).

Analysis of low cycle fatigue fracture surfaces by means of scanning electron microscopy yields quantitative information on crack initiation life. The procedure is based on crack growth information obtained from fatigue striation spacing measurements with the assumption that each striation is caused by one cycle. The procedure has been extended to quantify the effects on crack initiation life of circumferential notch geometries with theoretical stress concentration factors of 2, 3 and 4. The crack initiation measurements are used to determine the fatigue notch factor and the notch sensitivity and the implications of these results are discussed.

32556 Dependence of the fracture toughness of 4340 steel on an external chlorine gas environment. Sieradzki, K. (Iowa State Univ. and Ames Lab.); Ficalora, P. *Scr. Metall.;* **13**: 535-536(1979).

The effect of an external chlorine gas environment on the fracture toughness of a HSLA steel was investigated. Cracking occurred via a fast fracture. Premature fracture resulted from an adsorption induced process occurring on the surface. (FS)

32557 Nucleation phenomena in electron-hole drop formation in Ge and Si. III. Experimental results for Ge. Westervelt, R.M.; Staehli, J.L.; Haller, E.E. (Univ. of California, Berkeley). *Phys. Status Solidi (b);* **90**: No. 557, 557-569(1978).

A systematic experimental study and theoretical analysis of hysteresis and threshold phenomena in the luminescence of electron-hole drops (EHD) and free excitons (FE) in volume-excited crystals of ultrapure Ge is presented. Data are given between 1.2 and 2.0°K for (1) hysteresis curves for the EHD and FE luminescence intensity obtained by cycling the excitation; (2) metastable time development of the EHD signal for times $\sim = 4 \times 10^3$s; and (3) a calibrated phase diagram for the FE density thresholds n/sub +/ and n/sub -/ for the creation and destruction of EHD vs. T. Excellent agreement between these data and nucleation theory is found. The principal experimental results are: (1) reproducible hysteresis curves for EHD exhibiting well-defined excitation thresholds; (2) logarithmic variation of the EHD signal with time and direct evidence that individual EHD can exist for times $\sim = 6 \times 10^4$ s; (3) the first measurement $phi_0 = (1.9 +- 0.2)$ MeV of the EHD condensation energy from threshold data which correctly accounts for non-equilibrium effects, resolving previous discrepancies with spectroscopic data; and (4) an accurate measurement of the EHD surface energy $w = (2.6 +- 0.3) \times 10^{-4}$ erg cm^{-2}.

PHYSICAL PROPERTIES

REFER ALSO TO CITATION(S) 32527, 32530, 32557, 32685, 32725, 33062, 33063, 33146

32558 (EPRI-AP—1478) **Theoretical analysis of carbon cluster formation in solid iron-based alloys: a review of the Alex-McLellan mathematical model.** Small, M. (Pennsylvania State Univ., University Park (USA)). Aug 1980. 33p. NTIS, PC A03/MF A01.

Experimental results have indicated that in the early stages of the carburization of iron alloys at moderately high temperatures carbon-rich clusters form around some solute atoms. The atomic configurations of these clusters are as yet unknown. As these clusters are believed to comprise the intermediate metastable products in the formation or carbides during the tempering of alloy steels, it is necessary to understand their structural aspects completely. An initial step in this direction has been the examination of a previously developed statistical thermodynamic model for metallic solutions containing interstitial species. This model is outlined and discussed in detail, along with its application to an explanation of the results from the current study on the carburization of iron alloys containing chromium and molybdenum.

32559 (HEDL-TME—79-6) **Thermophysical properties of selected wear-resistant alloys.** Farwick, D.G.; Johnson, R.N. (Hanford Engineering Development Lab., Richland, WA (USA)). Jun 1980. Contract AC14-76FF02170. 97p. NTIS, PC A05/MF A01.

Thermophysical properties of 13 selected wear-resistant materials, including specific heat, thermal conductivity, thermal diffusivity, and thermal expansion (instantaneous, mean, and linear) are provided. The Center for Information and Numerical Data Analysis and Synthesis (CINDAS) at Purdue University supplied properties data.

32560 (LBL—11109) **Erosion-corrosion-wear program.** Levy, A.V. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Jul 1980. Contract W-7405-ENG-48. 25p. NTIS, PC A02/MF A01.

Excerpt from LBL-10000.

Progress is reported concerning erosion mechanics in ductile metals, erosion of thin scales, erosion mechanics in brittle solids, effect of particle characteristics on erosion of ductile material, and the halo effect in jet impingement solid particle erosion testing of ductile metals. Corrosion behavior studies by char and catalytic deactivation are reported. Gas-particle flow in the entry region of curved pipes, separation effects in gas-particle flows at high Reynolds number, and aerodynamic effects in the erosion process are discussed. (FS)

32561 (SERI/PR—9079-1-T1) **Structural and electronic studies of defects in amorphous silicon. Technical progress report, March-May 1980.** Street, R.A. (Xerox Palo Alto Research Center, CA (USA)). 15 Jul 1980. Contract AC02-77CH00178. 45p. NTIS, PC A03/MF A01.

Proton magnetic resonance data are presented for plasma-deposited amorphous Si:H as a function of annealing temperature up to 650°C. The data indicate that hydrogen diffuses internally before major evolution occurs, that transfer of hydrogen occurs from a heavily clustered phase to a dilute phase coincident with evolution and that evolution occurs initially from the heavily clustered phase. Comparison with infrared data indicates that the heavily clustered phase can be either SiH/ sub x/t = 2,3) or SiH.

32562 Low-energy optical absorption in α-U metal. Weaver, J.H. (Synchrotron Radiation Center University of Wisconsin-Madison, Stoughton, Wisconsin 53589). *J. Opt. Soc. Am.;* **70**: No. 8, 1030-1031(Aug 1980).

Optical absorption measurements with polycrystalline α-uranium between 0.15 and 2.0 eV at near-normal incidence and 4.2 K revealed structure at 0.34, ~0.77, and ~1.3 eV. These results are in contrast with those for other actinides where the low energy reflectance was reported to be featureless.

32563 Slow positrons in metal single crystals. I. Positronium formation at Ag(100), Ag(111), and Cu(111) surfaces. Lynn, K.G.; Welch, D.O. (Brookhaven National Laboratory, Upton, New York 11973). *Phys. Rev., B: Condens. Matter;* **22**: No. 1, 99-110(1 Jul 1980).

Monoenergetic positrons, with an incident energy of 0 —5 keV, were focused onto Ag(100), Ag(111), and Cu(111) surfaces with submonolayer contamination, and positronium formation was studied as a function of sample temperature from 300 to 1200 K. The data were fitted with a simple positron diffusion model including surface and vacancy trapping, assuming that positronium is formed only at the surface. The formation of part of the positronium fraction is found to be a temperature-activated process which is identified as detrapping from a surface state, and an estimate of the binding energy in this trap is deduced. The diffusion length is found to be only slightly temperature dependent between room temperature and the onset of vacancy trapping. At the higher sample temperatures positron trapping at thermally generated vacancies is observed by the decrease in the positron diffusion length at the higher incident voltages. A vacancy formation energy is extracted from the data and is generally found to be lower than the values obtained from bulk measurements.

32564 Low temperature resistivity of ordered and disordered A15 compounds. Gurvitch, M.; Ghosh, A.K.; Lutz, H.; Strongin, M. (Brookhaven National Laboratory, Upton, New York 11973). DE-ACOZ-76CH00016. *Phys. Rev., B: Condens. Matter;* **22**: No. 1, 128-136(1 Jul 1980).

The low-temperature electrical resistivity has been measured for the high-T/sub c/ A15 compounds Nb_3Sn, Nb_3Al, and Nb_3Ge and also a low-T/sub c/ compound Mo_3Ge. It is found that most of the high-T/sub c/ A15's exhibit a T^2 dependence in the temperature range T/sub c/ $< T <$ or ≈ 40 K, while Mo_3Ge shows a T^1 dependence on temperature. Data are also presented for irradiated Nb_3Sn which show that the T^2 power law is preserved for increasing

residual resistivity rho(0). Previous analyses of A15 resistivity are examined in some detail to show that the T^2 dependence in the low-temperature resistivity of high-T/sub c/ A15 materials is an intrinsic effect and is not crucially dependent on the real phonon structure in these materials. It is argued that the observed T^2 dependence remains an unsolved theoretical problem.

32565 Study of some hydrogenated vanadium-based A15 compounds. Huang, S.Z.; Skowskiewicz, T.; Chu, C.W.; Smith, J.L. (Department of Physics and Energy Laboratory, University of Houston, Houston, Texas 77004). *Phys. Rev., B: Condens. Matter;* **22**: No. 1, 137-141(1 Jul 1980).

The degrees of hydrogenation in V_3Ga, V_3Ge, and V_3Si were determined. The effects of hydrogen on the superconducting transition temperature T/sub c/, the lattice parameter, and the pressure dependence of T/sub c/ were measured. The results will be discussed and compared with those of other hydrogenated and radiation damaged A15 compounds.

32566 Nuclear spin—lattice relaxation measurements in small superconducting aluminum particles. Tse, P.K.; MacLaughlin, D.E. (Department of Physics, University of California, Riverside, California). *J. Low Temp. Phys.;* **39**: No. 3, 339-372(1 May 1980).

The ^{27}Al nuclear spin-lattice relaxation times T_1 have been measured in the normal and superconducting states of small aluminum particles with average particle diameters ranging from 170 to 750 A. Experiments were performed in magnetic fields between 0 and 1200 Oe and at temperatures between 0.5 and 4.2 K. The nuclear spin-lattice relaxation rate $1/T_1$ at zero and low magnetic fields is characterized by a sum of a Korringa rate (due to conduction-electron spin-flip scattering) and an additonal rate, which is attributed to a crossfield (1200 Oe), where the Zeeman energy either dominates in larger particles or play an important role in smaller particles, measured rates for all three samples are in good agrreement with the microscopic theory of Sone. At low fields (H< or =150 Oe) our T_1 results, which show a strong field dependence and less effect of superconducting fluctuations near T/sub c/, are in disagreement with Sone. We suggest that the theory has overestimated the effects of fluctuations on quasiparticle excitations at these low fields.

32567 Specific heat of high Tsub(c), A-15 Nbsub(0.75)Gasub(0.25). Stewart, G.R.; Webb, G.W. (Los Alamos Scientific Lab., NM (USA)). *Solid State Commun.;* **33**: No. 10, 1015-1018(Mar 1980).

The specific heat from 1.4 to 27°K has been measured on a Nb-Ga sample that was approximately 85% A-15 Nbsub(0.76)Gasub(0.24) with a Tsub(c) of 19.8°K and a transition width of 1°K. The data imply that the density of states for A-15 Nbsub(0.75)Gasub(0.25) is 1.7 +- 0.25 states/eV-atom, in good agreement with recent band structure calculations. The Debye temperature is found to increase approximately 1°K per degree from Tsub(c) down to 4°K, with thetasub(D)(0) = 280°K.

32568 Electronic states of fluorinated amorphous silicon. Ching, W.Y. (Argonne National Lab., IL). *J. Non-Cryst. Solids;* **35 & 36**: 61-66(1980). (DOE/ER/10449—1; CONF-790851—(Pt.1)).

From 8. international conference on amorphous and liquid semiconductors; Cambridge, MA, USA (27 Aug 1979).

The electronic structures of fluorinated amorphous silicon (a-Si) and that with hydrogen atom incorporated are studied by means of the first principles orthogonalized linear combination of atomic orbitals (OLCAO) method. The structural models employed are similar to those used in the study of hydrogenated a-Si in which the F atoms appear as SiF, SiF_2, and SiF_3 in an otherwise perfect random tetrahedral network. To elucidate the bonding character, the local density of states (LDOS) of F, H and the Si atom to which they bond, are calculated and resolved into orbital components. The F 2s levels are localized well below the valence band (VB). In the VB region, the LDOS are dominated by F 2p components; in the conduction band (CB) region, F has negligible LDOS. In the case of SiF_3, a gap state exists near the middle of the band gap with predominately Si 3s character. Results for the cases where F atoms are partially substituted by H atoms in SiF_2 and SiF_3 are also presented. It is found that the presence of H atoms has a pacifying effect near the gap region due to the effective bonding between Si 3s, Si 3p, and H 1s wave functions.

32569 Glow discharge optical spectroscopy measurement of dopant concentrations in a-Si:H. Zesch, J.C. (Xerox Palo Alto Research Center, CA); Lujan, R.A.; Deline, V.R. Contract 03-79-ET-23033. *J. Non-Cryst. Solids;* **35 & 36**: 273-277(1980). (DOE/ER/10449—1; CONF-790851—(Pt.1)).

From 8. international conference on amorphous and liquid semiconductors; Cambridge, MA, USA (27 Aug 1979).

The results of glow discharge optical spectroscopy (GDOS) measurements of total dopant concentrations in a-Si:H films are reported. Significant differences (up to a factor of 4.8) were found between the ratio of boron to silicon of the films and that of their deposition plasmas.

32570 Electronic and structural properties of plasma-deposited a-Si:O:H. The story of O_2. Knights, J.C.; Street, R.A.; Lucovsky, G. (Xerox Palo Alto Research Center, CA). Contract 03-79-ET-23033. *J. Non-Cryst. Solids;* **35 & 36**: 279-284(1980). (DOE/ER/10449—1; CONF-790851—(Pt.1)).

From 8. international conference on amorphous and liquid semiconductors; Cambridge, MA, USA (27 Aug 1979).

Measurements of luminescence, optical absorption and infrared vibrational spectra are reported for thin films plasma-deposited from $SiH_4/O_2/Ar$ mixtures. The addition of oxygen causes the optical absorption edge and luminescence peak position to shift monotonically to higher photon energy. Increases in the luminescence peak width and in the temperature of thermal quenching result in room temperature luminescence in the visible at high oxygen contents.

32571 Electronic transport in bandgap states of hydrogenated amorphous silicon. Crandall, R.S. (RCA Lab., Princeton, NJ). Contract ET-78-C-03-2219. *J. Non-Cryst. Solids;* **35 & 36**: 381-386(1980). (DOE/ER/10449—1; CONF-790851—(Pt.1)).

From 8. international conference on amorphous and liquid semiconductors; Cambridge, MA, USA (27 Aug 1979).

Measurements of the primary photocurrent for photon energies between 0.58 and 2.0 eV in an a-Si:H solar-cell structure give information about the density of states above the valence band as well as show that holes are mobile deep in the bandgap. Measurements of the response time of the secondary photocurrent as well as its magnitude are used to determine the majority carrier drift mobility for excitation energies above and below the bandgap. The drift mobility is independent of excitation energy indicating that the majority carriers are excited to the same states irrespective of the excitation energy.

32572 Hole diffusion length measurements in discharge-produced a-Si:H. Staebler, D.L. (RCA Lab., Princeton, NJ). Contract EY-76-C-03-1286. *J. Non-Cryst. Solids;* **35 & 36**: 387-390(1980). (DOE/ER/10449—1; CONF-790851—(Pt.1)).

From 8. international conference on amorphous and liquid semiconductors; Cambridge, MA, USA (27 Aug 1979).

Hole diffusion measurements were done on a large-area structure consisting of an undoped layer of a-Si:H with graded thickness, sandwiched between a thin p+ layer, and a thin n+ layer. A small spot of free carriers was generated on the n+ side with a beam from a HeCd laser. This produced a current due to holes collected on the p+ side. Areas of different undoped layer thickness were successively exposed to the beam. The measured variation of short-circuit current with thickness showed that the hole diffusion was less than 350 A, the absorption depth of the laser beam.

32573 Optical absorption by gap states in hydrogenated amorphous silicon. Pankove, J.I. (RCA Lab., Princeton, NJ); Pollak, F.H.; Schnabolk, C. Contract EY-76-C-03-1286. *J. Non-Cryst. Solids;* **35 & 36**: 459-462(1980). (DOE/ER/10449—1; CONF-790851—(Pt.1)).

From 8. international conference on amorphous and liquid semiconductors; Cambridge, MA, USA (27 Aug 1979).

An absorption band peaking at ~1.25 eV has been observed as a structure in the photovoltaic and photoconductivity spectra of several samples of hydrogenated amorphous silicon. This transition at ~1.25 eV appears to be the inverse of the luminescence process, suggesting that these transitions occur between donors and acceptors.

32574 Study of the electronic structure of a-Si:H by tunneling. Balberg, I. (RCA Lab., Princeton, NJ). Contract ET-78-C-2119. *J. Non-Cryst. Solids;* **35 & 36**: 605-610(1980). (DOE/ER/10449—1; CONF-790851—(Pt.1)).

From 8. international conference on amorphous and liquid semiconductors; Cambridge, MA, USA (27 Aug 1979).

Measurements of the tunneling and phototunneling I-V and G-V characteristics have enabled the study of the distribution of states in the band-gap of hydrogenated amorphous silicon. It is found that regardless of the method of preparation and the material dopants there is a peak in the bulk and surface density of states which lies 0.45 eV below the conduction band edge. The density of states at the peak is concluded to be 10^{18} - 10^{19} cm^{-3} eV^{-1}, decreasing by at least an order of magnitude for energies below and above this peak.

32575 Thermal expansion of molten tin, lead, and aluminum to 1300°K. Drotning, W.D. (Sandia Lab., Albuquerque, NM). Contract DE-AC04-76-DP00789. *High Temp. Sci.;* **11**: No. 4, 265-276(Dec 1979).

An apparatus is described for the measurement of the thermal expansion and density of molten materials to 1300°K using the gamma radiation attenuation technique. Results are presented for the densities of tin, lead, and aluminum from their melting points to 1300°K. These data compare well with results from previous investi-

gations using different measurement techniques. A significant nonlinear relation in the density-temperature curve for molten tin was seen above 1100°K. Our results also tend to confirm data from other techniques that suggest a smaller thermal expansion coefficient for molten aluminum than has been recommended in the literature. In spite of the wide variation in molten density among these three materials, a density thermal expansion coefficient of -1 x 10^{-4}/K adequately describes the expansion in the melt for each material. The density thermal expansion coefficient in the melt was found to be nearly equal to $3\alpha_l$, where α_l is the linear thermal expansion coefficient of the solid near the melting point.

CORROSION AND EROSION

REFER ALSO TO CITATION(S) 31471, 31490, 31548

32576 (CONF-800834—1) **Comparison of the high temperature oxidation behavior of Zircaloy-4 and pure zirconium.** Pawel, R.E.; Campbell, J.J. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 28p. NTIS, PC A03/MF A01.

From 5. international conference on zirconium in the nuclear industry; Boston, MA, USA (4 Aug 1980).

Oxidation rate data for Zircaloy-4 in steam under isothermal conditions in the temperature range 1000-1500°C indicate that the kinetics of layer growth and oxygen consumption can be described by virtually ideal parabolic behavior. The growth of the two product phases, oxide and oxygen-stabilized alpha, is presumed to be controlled by diffusion processes leading to uniform layer thickening. We have measured the oxidation rate of pure, arc-melted, crystal-bar zirconium under similar conditions and have found differences in the reaction characteristics compared to Zircaloy-4. At temperatures from 1098 to 1416°C, while parabolic kinetics are still observed, the growth rates for both phases are measurably different. Our analysis of these data in terms of a multi-layer diffusion model suggests that the effective chemical diffusion coefficient for oxygen in the oxide phase has been altered. However, despite the kinetic differences, the analysis also concludes that the diffusion coefficient of oxygen in the alpha layers is identical, a finding consistent with the results of independent measurements.

32577 (DP—1550) **Corrosion of high Ni-Cr alloys and Type 304L stainless steel in HNO_3-HF.** Ondrejcin, R.S.; McLaughlin, B.D. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Apr 1980. Contract AC09-76SR00001. 46p. NTIS, PC A03/MF A01.

Nineteen alloys were evaluated as possible materials of construction for steam heating coils, the dissolver vessel, and the off-gas system of proposed facilities to process thorium and uranium fuels. Commercially available alloys were found that are satisfactory for all applications. With thorium fuel, which requires HNO_3-HF for dissolution, the best alloy for service at 130°C when complexing agents for fluoride are used is Inconel 690; with no complexing agents at 130°C, Inconel 671 is best. At 95°C, six other alloys tested would be adequate: Haynes 25, Ferralium, Inconel 625, Type 304L stainless steel, Incoloy 825, and Haynes 20 (in order of decreasing preference); based on composition, six untested alloys would also be adequate. The ions most effective in reducing fluoride corrosion were the complexing agents Zr^{4+} and Th^{4+}; Al^{3+} was less effective. With uranium fuel, modestly priced Type 304L stainless steel is adequate. Corrosion will be most severe in HNO_3-HF used occasionally for flushing and in solutions of HNO_3 and corrosion products (ferric and dichromate ions). HF corrosion can be minimized by complexing the fluoride ion and by passivation of the steel with strong nitric acid. Corrosion caused by corrosion products can be minimized by operating at lower temperatures.

32578 (LBL—11030) **Nuclear materials research progress reports for 1979.** Oiander, D.R. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Dec 1979. Contract W-7405-ENG-48. 81p. NTIS, PC A05/MF A01.

Research is presented concerning iodide stress corrosion cracking of zircaloy, self-diffusion of oxygen in hypostoichiometric urania, surface chemistry of epitaxial silicon deposition by thermal cracking of silane, kinetics of laser pulse vaporization of UO_2, gas laser model for laser induced evaporation, solubility of hydrogen in uranium dioxide, thermal gradient migration of metallic inclusions in UO_2, molecular beam studies of atomic hydrogen reduction of oxides, and thermal gradient brine-inclusion migration in salt. (FS)

32579 **Compatibility of molten salts with type 316 stainless steel and lithium.** Keiser, J.R.; DeVan, J.H.; Lawrence, E.J. (Oak Ridge National Lab., TN (USA)). *J. Nucl. Mater.;* **85**: No. 86, 295-298(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

Molten salts with possible application in fusion reactors have been studied. The corrosion rate of type 316 stainless steel in LiF-BeF_2, KNO_3-$NaNO_2$-$NaNO_3$, and LiF-LiCl-LiBr was strongly affected by the temperature and oxidation potential of the salt. A rapid exothermic reaction occurred when KNO_3-$NaNO_2$-$NaNO_3$ was melted with lithium.

32580 **Passivity of metals.** Frankenthal, R.P. (Bell Labs., Murray Hill, NJ); Kruger, J. (eds.). Contract AC02-77ER04266. Princeton, NJ; Electrochemical Society, Inc. (1978). 1093p. (COO—4266-1; CONF-7710234—).

From 4. international symposium on passivity; Warrenton, VA, USA (17 Oct 1977).

Separate abstracts have been prepared for items within the scope of the energy data base.

32581 **Film growth and breakdown processes on aluminum observed by electron microscopy.** Metzger, M. (Univ of Illinois, Urbana); Zahavi, J. pp 960-972 of Passivity of metals. Frankenthal, R.P. (Bell Labs., Murray Hill, NJ); Kruger, J. (eds.). Princeton, NJ; Electrochemical Society, Inc. (1978).

From 4. international symposium on passivity; Warrenton, VA, USA (17 Oct 1977).

One experimental approach to questions of film breakdown and its mechanisms is through electron microscopic study of the microtopography of film and substrate associated with the initial failure events. An approach for anodic films on aluminum was developed and applied to investigate the roles of several variables in film stability and breakdown. A description is presented of the model and of several current applications. This work has been conducted using porous anodic films formed in sulfuric acid, which provide both a characteristic structure often useful in interpreting the observations and which are sufficiently robust to be readily detached and examined in transmission. The work has been kept within a narrow range of experimental conditions. The results showed that under the conditions employed breakdown and transient pitting occur readily during stable film growth, and the central consideration here is then the character of the passive state.

RADIATION EFFECTS

REFER ALSO TO CITATION(S) 32214, 32247, 32249, 32533, 32544, 33131, 33149, 33150

32582 (HEDL-SA—2078) **Frank loop unfaulting mechanism in fcc metals during neutron irradiation.** Gelles, D.S. (Hanford Engineering Development Lab., Richland, WA (USA)). May 1980. Contract AC14-76FF02170. 11p. (CONF-800696—1). NTIS, PC A02/MF A01.

From International conference on dislocation modeling of physical systems; Gainesville, FL, USA (22 Jun 1980).

The unfaulting mechanism whereby sessile Frank dislocation loops evolve into a complex tangle of glissile dislocations during irradiation of face centered cubic metals is not well understood. It is presumed that such loops grow by absorption of point defects until interactions develop which provide sufficient impetus for nucleation of an unfaulting event. The loops then become glissile, interact and form a dislocation network. An alternate mechanism which has been observed to occur in an austenitic precipitation-strengthened commercial alloy irradiated in the EBR-II fast reactor. The mechanism requires an interaction between the sessile a/3 <111> Frank loop and a moving glissile a/2 <110> perfect dislocation. An unfaulting a/6 <112> dislocation is created which, as it moves, eliminates the Frank loop and leaves only a perfect dislocation with the original a/2 <110> Burgers vector. This process is demonstrated. This alternate mechanism can have significant impact on the development of the dislocation microstructure in a metal undergoing irradiation creep. This impact will be discussed in relation to relevant irradiation creep models.

32583 **Formation of Pd_3W in proton irradiated palladium-rich Pd-W alloys.** Weaver, L.; Ardell, A.J. (Univ. of California, Los Angeles). *Scr. Metall.;* **14**: No. 7, 765-768(Jul 1980).

Observations are reported on radiation induced microstructures in Pd-W alloys. Proton irradiation at temperatures of 300°C and above was used. Results suggest that the face-centered tetragonal phase A_3B may be more common than supposed. It is possible that A_3B is a degenerate ground state structure. (FS)

32584 **Effects of irradiation on the normal metal of a composite superconductor: A comparison of copper and aluminum.** Klabunde, C.E.; Coltman, R.R.; Williams, J.M. (Oak Ridge National Lab., TN (USA). Solid State Div.). *J. Nucl. Mater.;* **85**: No. 86, 385-389(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

The most economical design of a superconducting magnet for a fusion reactor will depend sensitively on the irradiation-induced changes in magnetoresistance which can be expected during its life. This report presents new data on damage production for aluminum that were obtained in neutron irradiation experiments at 4 K. These data are combined with previously obtained results on saturation

effects and magnetoresistivity to yield a projection of total resistivity vs neutron dose (expressed in displacements per atom) for aluminum in service at < 10 K in a magnetic field. The results are compared closely with those obtained previously for copper, using the same method of analysis.

32585 Spatial variation in void volume during charged particle bombardment - the effects of injected interstitials. Lee, E.H.; Mansur, L.K.; Yoo, M.H. (Oak Ridge National Lab., TN (USA)). *J. Nucl. Mater.;* **85**: No. 86, 577-581(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

Experimental observations of the void volume at several depths along the range of 4 MeV Ni ions in 316 stainless steel are reported. The specimens were first preconditioned by neutron irradiation at temperatures of 450 and 584°C to fluences of approximately 8 x 10^{26} n/m^{-2}. The void volume after ion bombardment to 60 dpa at the peak damage depth is significantly lower at the peak damage depth than in the region between that and the free surface. The ratio of the step height to void volume at the depth of peak energy deposition between regions masked from and exposed to the beam is strongly dependent on bombardment temperature. The reduction of void volume near the peak damage depth is larger for the 584°C than for the 450°C neutron irradiated material. These observations are consistent with recent theoretical results which account for the injection of the bombarding ions as self-interstitials.

32586 Advances in the theory of swelling in irradiated metals and alloys. Mansur, L.K.; Yoo, M.H. (Oak Ridge National Lab., TN (USA)). *J. Nucl. Mater.;* **85**: No. 86, 523-532(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

Recent advances in the theory of swelling are reviewed. These include (1) the development of a cascade diffusion theory to treat quantitatively the fluctuations in point defect concentrations caused by locally inhomogeneous point defect production, (2) the incorporation of mobile helium and its effects on void growth into the theory, and (3) the spatial variation in swelling during charged particle bombardment. Summaries of (1) and (2) are given. A more complete development of (3) is presented. Three phenomena responsible for spatial variation of swelling during heavy-ion bombardment are assessed. Loss of point defects to the free surface results in only a minor perturbation of swelling under the usual conditions considered. Interstitials injected by the bombarding beam may severely deplete the void volume under certain conditions. The effect is extremely sensitive to defect and materials parameters and is largest for low swelling materials. The previously unexplored depletion of swelling resulting from diffusional spreading of point defects out of the region of maximum energy deposition is evaluated and found to be significant.

32587 Nature of high energy neutron damage in copper and gold. Narayan, J.; Ohr, S.M. (Oak Ridge National Lab., TN (USA). Solid State Div.). *J. Nucl. Mater.;* **85**: No. 86, 515-519(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

Transmission electron microscope studies have been made on the defect clusters in high-purity copper and gold single crystals produced by d-Be, D-T and fission neutron irradiations at ambient temperatures. The vacancy or interstitial nature of the defect clusters and Burgers vectors and habit planes were determined from the direction of the black-white contrast in dynamical images of the clusters and from depth information obtained from stereo measurements. Studies were also made using the weak-beam technique combined with stereo measurements to obtain spatial distribution information on vacancy clusters. It is shown that the nature of high-energy neutron damage is quite similar to fission neutron damage for copper. Significant differences between high energy and fission neutron damage particularly in the amount of retained damage, exist in the case of gold.

CERAMICS, CERMETS, AND REFRACTORIES

REFER ALSO TO CITATION(S) 31475

32588 Infrared spectra of hydrogen isotopes in potassium tantalate. Engstrom, H.; Bates, J.B.; Boatner, L.A. (Solid State Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *J. Chem. Phys.;* **73**: No. 3, 1073-1077(1 Aug 1980).

The spectroscopic constants of hydroxyl ions formed from hydrogen, deuterium, and tritium in a potassium tantalate ($KTaO_3$) host have been determined. These isotopes were found to diffuse readily either into or out of $KTaO_3$ single crystals. At T=77 K the infrared absorption band due to the OH^-, OD^-, or OT^- stretching vibration is extremely narrow (i.e., ~1.0, 0.8, and 0.7 cm^{-1}, respectively). These results indicate that the interaction between the hydroxyl ions and the surrounding lattice is very weak. The optical properties of hydroxyl ions and the characteristic features of hydrogen diffusion in $KTaO_3$ are compared with those determined previously for aluminum oxide (Al_2O_3) and rutile (TiO_2).

PREPARATION AND FABRICATION

REFER ALSO TO CITATION(S) 32246, 32250, 32274, 32347

32589 (LBL—10392) Influence of surface silica impurities on the sintering behavior of alumina powders. Moya, J.S.; Pask, J.A. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Feb 1980. Contract W-7405-ENG-48. 25p. (CONF-800902—1). NTIS, PC A02/MF A01.

From 9. international symposium on the reactivity of solids; Cracow, Poland (1 Sep 1980).

The filtering, pressing and sintering behavior of an alumina powder with and without silica impurity on surface has been studied. When silica is removed from surface by HF-treatment and compactibility is considerably enhanced due to the different acidity/basicity nature of the OH of the hydroxyl layers. The silica impurity decreases the activation energy of the initial stage of sintering and grain boundary energy, improves the densification process and exerts a moderate inhibitor effect on the grain growth.

STRUCTURE AND PHASE STUDIES

REFER ALSO TO CITATION(S) 32422, 32594

32590 Pseudobinary Zircaloy-oxygen phase diagram. Chung, H.M.; Kassner, T.F. (Argonne National Lab., IL (USA)). *J. Nucl. Mater.;* **84**: No. 1-2, 327-339(Oct 1979).

The zirconium-rich portion of the pseudobinary zircaloy-4/oxygen phase diagram was investigated by resistometric measurements and by metallographic analysis of equilibrated and quenched specimens. Accurate results for the phase-boundary locations were obtained from metallographic analysis of specimens in which oxidation and homogenization were limited to the α-phase region, and the specimens were rapidly quenched from equilibration temperatures in the β- and (α + β)-phase regions. The α- and β-phase boundaries can be represented by the realtions ln Csub(α) = -2.28 + 0.535 ln (T - 1083) and ln Csub(β) = 5.02 - 8220/T (for T > 1280 or Csub(β)>0.2), where Csub(α) and Csub(β) are the oxygen concentrations in weight percent and T is temperature in °K.

32591 Residual image contrast of dislocation loops. Narayan, J.; Ohr, S.M. (Oak Ridge National Lab., TN). *Phys. Status Solidi (a);* **46**: No. 281, 281-284(1978).

The electron microscope images of large dislocation loops lying perpendicular to the electron beam are calculated by applying the image simulation technique. It is found that the residual double arc contrast arising from the g.b x u term exhibits asymmetry which is depth dependent. The predictions of the theory are verified experimentally for a[001] dislocation loops observed in single crystals of MgO. The depth oscillation of the residual contrast can be used to determine the vacancy or interstitial nature of dislocation loops.

MECHANICAL PROPERTIES

REFER ALSO TO CITATION(S) 31682, 33121, 33135

32592 (PNL-TR—405) Boron carbide: high-performance industrial material. Part 2. Industrial applications of boron carbide. Beauvy, M.; Thevenot, F. Translated from *Ind. Ceram.;* No. 734, vp(Dec 1979). 22p. NTIS, PC A02/MF A01.

Boron carbide is considered a strategic material in the nuclear and military fields, applied research work on this material has been principally oriented toward applications in these two sectors. Hence, today the greatest tonnage of industrially-produced boron carbide is used for the manufacture of absorbers for nuclear power plants and for the manufacture of light armors. It is probable that the orientation of these studies and the non-disclosure of the results of research in these two high-technology areas have done little to favor the development of the numerous other industrial applications one might expect in view of the properties of boron carbide. Better knowledge of the mechanisms controlling the mechanical and physical properties of the carbide is needed before one can conceive new openings for this promising product, particularly in technology for new energy sources. It is also possible to find the means to increase the oxidation resistance of boron carbide without altering its properties. This will make it possible to extend further the area of its industrial applications.

PHYSICAL PROPERTIES

REFER ALSO TO CITATION(S) 32347, 32355, 32421, 32422, 32432, 32578, 32592, 33136, 33142

32593 (SAND—80-0298C) **Thermal accommodation coefficient of helium and argon on an amorphous SiO_2 surface.** McFall, A. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 22p. (CONF-800715—2). NTIS, PC A02/MF A01.

From 12. international symposium on rarefied gas dynamics; Charlottesville, VA, USA (7 Jul 1980).

The thermal accommodation coefficient was determined for the interaction of two inert gases, helium and argon, on a surface composed of thermally grown amorphous silicon dioxide. The surface was processed as an integrated circuit chip and utilized components capable of generating heat and measuring temperature. The accommodation coefficient of helium on clean SiO_2 was found to be 0.198, while that for argon was 0.421. Both one-dimensional and three-dimensional continuum theory models of the accommodation coefficient were used for comparison with the experimental data. Correlation for helium is good when the well depth and range parameter of the Morse interacting gas potential are chosen to be: a = 1.67 A^{-1} and D = 550 cal/mole. The Debye temperature was computed from elastic constants to be 498°K.

32594 **Crystal field effects in magnetic superconducting Er/sub 1-x/Tm/sub x/Rh_4B_4 and Er/sub 1-x/Ho/sub x/Rh_4B_4.** Maekawa, S.; Smith, J.L.; Huang, C.Y. (Research Institute for Iron, Steel, and Other Metals, Tohoku University, Sendai 980, Japan). *Phys. Rev., B: Condens. Matter;* **22**: No. 1, 164-167(1 Jul 1980).

The magnetic and superconducting transitions have been measured in Er/sub 1-x/Tm/sub x/Rh_4B_4 and crystal-field theory has been used to explain these transitions and those in Er/sub 1-x/Ho/sub x/Rh_4B_4. The minimum observed in the magnetic transition temperature versus x curve in Er/sub 1-x/Ho/sub x/Rh_4B_4 has been identified as the first example of a "decoupled" ferromagnetic tetracritical point. The theoretical phase diagrams are in reasonable agreement with the data and hence lead to further understanding of the details. The absence of the specific-heat shoulders above the superconducting-to-ferromagnetic transitions in these pseudoternaries is discussed.

32595 **Neutron scattering as a probe of small-particle dynamics in hydroxylated amorphous silica.** Richter, D.; Passell, L. (Institut fuer Festkoerperforschung, Kernforschungsanlage Juelich, D-5170 Juelich, Germany). DE-AC02-76CH00016. *Phys. Rev. Lett.;* **44**: No. 24, 1593-1597(16 Jun 1980).

Incoherent, inelastic scattering of neutrons by hydrogen in surface hydroxyl groups has been used to probe the dynamics of 60—70-A-diameter spheres of amorphous silica. The high-temperature spectra indicate a pronounced "small-particle" enhancement of low-frequency vibrational modes as predicted by theory. At low temperatures, the scattering changes in character and shows evidence of hindered rotational transitons.

32596 **Low-temperature magnetic properties of $HoRh_4B_4$.** Ott, H.R.; Woolf, L.D.; Maple, M.B.; Johnston, D.C. (Laboratorium fuer Festkoerperphysik, ETH-Hoeggerberg, Zurich, Switzerland). EY-76-S-03-0034-PA227-3. *J. Low Temp. Phys.;* **39**: No. 3, 383-396(1 May 1980).

The low-temperature magnetic properties of $HoRh_4B_4$ have been studied by means of measurements of the magnetic susceptibility, magnetization, specific heat, thermal expansion, and magnetostriction. The ferromagnetic phase transition at T/sub M/=6.7 K shows almost ideal S=1/2 mean field behavior in the specific heat. Crystal field effects due to the splitting of the J=8 Hund's rule ground state of the Ho^{3+} ions result in Schottky anomalies in the specific heat and the thermal expansion and are also revealed in the low-field magnetic susceptibolity and the magnetostriction. Information on the ground state doublet of the 4f electrons has been obtained from the nuclear contribution to the specific heat below 1 K and the high-field magnetization below T/sub M/.

32597 **Ionic conduction in doped zirconia.** Hohnke, D.K. (Ford Motor Co., Dearborn, MI). pp 669-672 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

The experimental data for ionic conduction in doped zirconia are examined and related to results obtained with other doped fluorite-type oxides. Several previously unrecognized relationships are discovered and analyzed. It is shown that excellent agreement is obtained between experimental and calculated conductivities if a theoretical model, based on nearest neighbor defect interactions, is modified by a free energy-like function G(x), a parameter for long range interactions.

32598 **Alkali ion conductivity in rapidly quenched glasses.** Glass, A.M.; Nassau, K.; Olson, D.H. (Bell Telephone Labs., Holmdel, NJ). pp 707-712 of Fast ion [illegible] lids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

A number of new glasses have been prepared without any network formers, by rapid quenching from the melt. These include alkali niobates, tantalates, tungstates, molybdates, aluminates, gallates, bismuthates, zincates and a variety of sulfates. Many of these do not devitrify below 400°C. The glasses exhibit considerably greater ionic conductivity than crystalline solids of the same composition. Room temperatures conductivities close to 10^{-3} $(ohm\ cm)^{-1}$ have been achieved. We report a systematic study of the effect of ionic radius and alkali ion content on the conductivity in an effort to optimize the structure and composition for application as solid electrolytes.

32599 **Ionic conductivity in lithium oxide-fluoride glasses.** Boehm, L.; Angell, C.A. (Purdue Univ., Lafayette, IN). pp 719-722 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Li^+-rich borate glasses, containing lithium oxide, lithium fluoride, and other lithium salts exhibit high electrical conductivities at elevated temperature (1.5 x 10^{-3} $(\Omega cm)^{-1}$ at 200°C). The ionic conductivities σ and the activation energies E/sub σ/ were investigated as a function of F^-/O^- ratios in these glasses. The results indicate an increase in conductivity and a decrease in activation energy with an increase in LiF content in the system. The influence of the thermal history on σ was studied based on the dependence of T/sub g/ on the heating or cooling rate.

CORROSION AND EROSION

REFER ALSO TO CITATION(S) 32421

RADIATION EFFECTS

REFER ALSO TO CITATION(S) 32578, 33110, 33135, 33141, 33144

COMPOSITE MATERIALS

PREPARATION AND FABRICATION

32600 **Structure and mechanical properties of Al/Al/sub x/0/sub y/ vacuum-deposited laminates.** Springer, R.W.; Catlett, D.S. (Los Alamos Scientific Lab., NM). *Thin Solid Films;* **54**: 197-205(1979).

A novel technique was developed to produce a laminate of Al/Al/sub x/0/sub y/ by a pulsed gas process in an electron beam gun system. Samples of 25 μm and thicker have been readily produced. The surface finish of the growing deposit appears to remain as smooth as the glass substrate. The tensile testing data for layer spacings of 50 to 1200 nm show that the material obeys a Hall-Petch relation for yield strength. The friction stress was measured directly on a pure vapor-deposited sample at 27 MPa. The K value was found to be 0.086 MNm/sup -3/2/.

MECHANICAL PROPERTIES

REFER ALSO TO CITATION(S) 32600

32601 (SAND—80-0104C) **Room-temperature transverse compressive creep of thick Kevlar fabric/ epoxy laminates.** Ericksen, R.H.; Guess, T.R. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 20p. (CONF-801010—3). NTIS, PC A02/MF A01.

From 12. National Society for the Advancement of Materials and Process Engineering technical conference; Seattle, WA, USA (7 Oct 1980).

Creep and recovery of thick Kevlar 49/epoxy composites were investigated in transverse compressive loading at room temperature. Cylindrical samples with void contents of 4 and 14 percent were tested along with those of unreinforced resin. The composites exhibited logarithmic creep. Creep rates were 2 times higher over the entire stress range for the high porosity composites. At a stress of 87 MPa the resin creep curve was similar to that of the composites. At higher stresses, the resin crept faster and exhibited more strain. It is proposed that axial compressive creep of the cylindrical composite specimens is governed by Poisson induced strains leading to tensile loading of the reinforcing fibers. Axial initial strain and creep rate data for the composite were converted to radial data using measured values of Poisson ratio. These values of composite specimen radial creep rate were in good agreement with tensile creep data of Kevlar 49 fibers.

32602 (UCRL—15264) **Evaluation of filament-wound Kevlar-49/epoxy fatigue properties. Final report.** (AiResearch Mfg. Co., Torrance, CA (USA)). 3 Jun 1980. Contract W-7405-ENG-48. 32p. NTIS, PC A03/MF A01.

This study was conducted by AiResearch Manufacturing of California for LLL to investigate the long-term properties of Kevlar-49/epoxy composite in a fatigue and elevated temperature environment to provide additional information on the material properties of Kevlar-49/epoxy for use in the design of composite flywheel energy storage units. Testing showed that Kevlar-49 has the unusual property of increasing tensile modulus of elasticity under fatigue loading conditions. The change in modulus was shown to be a function of temperature, induced stress level, and number of fatigue cycles. The average modulus before cycling was 13.28 x 10^6 psi at ambient temperature versus 11.96 x 10^6 psi at 150°F. Creep or residual strain after 100,000 cycles was 4.1 x 10^{-4} in/in (ambient) and 11.7 x 10^{-4} in/in (150°F) at 140 ksi maximum stress level. At 190 ksi temperature did not show any effects on creep, which was measured to be approximately 28 x 10^{-4} in/in. The ultimate strength of 150°F rings was 249,000 psi compared to 262,000 psi for ambient temperature.

POLYMERS AND PLASTICS

REFER ALSO TO CITATION(S) 32763

MECHANICAL PROPERTIES

REFER ALSO TO CITATION(S) 32601

PHYSICAL PROPERTIES

REFER ALSO TO CITATION(S) 32044

DEGRADATION AND EROSION

REFER ALSO TO CITATION(S) 32044

OTHER MATERIALS

PREPARATION AND MANUFACTURE

REFER ALSO TO CITATION(S) 31790, 31791, 31792, 31793, 31794, 31795, 31796, 31797, 31798, 31799, 31800, 31803, 31804, 31805, 31806, 31808, 31809, 31811, 31812, 31813, 31814, 31815, 31816, 31817, 31819, 31820, 31821, 31823, 31824

32603 **Method of preparation of novel fiber reinforced titanium diboride composite bodies and uses therefor.** Newkirk, L.C.; Riley, R.E.; Valencia, F.A.; Wallace, T.C. Sr. US Patent Application 085,551. [nd]. 13p.

Cloth is coated with titanium diboride in a chemical vapor deposition reaction under particular coating conditions which result in a uniform coating on the individual filaments making up the cloth fiber bundles. The coated cloth can be used as deposited as electrodes, for example, or can be hot pressed to form highly spall-resistant structures having special utility in fusion reactors, for example, as wall armor.

32604 (BDX—613-2441) **Boron reclamation.** Smith, R.M. (Bendix Corp., Kansas City, MO (USA)). Jul 1980. Contract AC04-76DP00613. 86p. NTIS, PC A05/MF A01.

A process to recover high purity ^{10}B enriched crystalline boron powder from a polymeric matrix was developed on a laboratory basis and ultimately scaled up to production capacity. The process is based on controlled pyrolysis of boron-filled scrap followed by an acid leach and dry sieving operation to return the powder to the required purity and particle size specifications. Typically, the recovery rate of the crystalline powder is in excess of 98.5 percent, and some of the remaining boron is recovered in the form of boric acid. The minimum purity requirement of the recovered product is 98.6 percent total boron.

STRUCTURE AND PHASE STUDIES

REFER ALSO TO CITATION(S) 32539, 33059

32605 **Effect of hydrostatic pressure on the incommensurate phase of K_2SeO_4.** Press, W.; Majkrzak, C.F.; Axe, J.D.; Hardy, J.R.; Massa, N.E.; Ullman, F.G. (Brookhaven National Laboratory, Upton, New York 11973). *Phys. Rev., B: Condens. Matter;* **22**: No. 1, 332-335(1 Jul 1980).

A neutron scattering study of the effect of hydrostatic pressure on the incommensurate phase transformation in K_2SeO_4 was performed in order to obtain information concerning the nature of the competing forces that give rise to a structural instability at a general wave vector. It was found that an increase in pressure lowers the transition temperature (dT/sub i//dP/sub i/=-6.5 K/kbar) and results in a smaller value of the initial incommensurate wave vector. The pressure dependence of the incommensurate to ferroelectric phase transition was also investigated (dT/sub c//dP/sub c/ ≃ -9 K/kbar). The latter transition displays a distinct pressure hysteresis.

32606 **Low-temperature study of ^{23}Na satellite spectra in β-alumina.** Highe, A.; Polak, M.; Vaughan, R.W. (California Inst. of Tech., Pasadena, CA). pp 305-307 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Details of the sodium ion motion (site-exchange processes) in β-alumina have been obtained from analysis of first-order quadrupolar ^{23}Na NMR spectra. Satellite spectra were studied as a function of crystal orientation and temperature using a recently developed double-resonance technique which provides a sensitive, although indirect, means to obtain such first-order spectra. The temperature-dependent changes in the multiplet structure of the spectra have allowed characterization of the sodium site-exchange processes present.

32607 **Electron spin relaxation by tunneling states in Na-β-Al_2O_3.** Kurtz, S.R.; Stapleton, H.J. (Univ. of Illinois, Urbana). pp 319-322 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Electron spin relaxation measurements on a color center in the conduction plane of sodium beta alumina reveal an exceptionally fast rate with an anomalous temperature and microwave frequency dependence. The observed behavior is quantitatively described by a relaxation mechanism involving the coupling of a color center to the phonon induced relaxation of a nearby localized two level tunneling state. These states are associated with disorder in the conduction plane of sodium beta alumina and have been used to explain the low temperature properties of beta aluminas and other amorphous materials. The density of such tunneling states, required to explain our data, agrees well with that used to explain the low temperature properties of sodium beta alumina.

PROPERTIES

REFER ALSO TO CITATION(S) 31797, 32348, 32578

32608 **Structure of ultrathin oxide on silicon.** Krivanek, O.L.; Mazur, J.H. (Department of Materials Science and Mineral Engineering, University of California, Berkeley, California 94720). W-7405-ENG-48. *Appl. Phys. Lett.;* **37**: No. 4, 392-394(15 Aug 1980).

30-A-thick oxide on silicon has been examined in cross section by high-resolution electron microscopy. The oxide thickness was uniform to within 5 A, even though the oxide undulated up to 8 A in height and with about 50 A periodicity.

32609 **Semiconductor properties of polyacetylene p-(CH)/sub x/ : n-CdS heterojunctions.** Ozaki, M.; Peebles, D.; Weinberger, B.R.; Heeger, A.J.; MacDiarmid, A.G. (Laboratory for Research on the Structure of Matter, University of Pennsylvania, Philadelphia, Pennsylvania 19104). DE-AC04-79ET-23002. *J. Appl. Phys.;* **51**: No. 8, 4252-4256(Aug 1980).

Trans:(CH)/sub x/:n-CdS heterojunctions have been fabricated and used to study the properties of undoped trans-polyacetylene. The I-V data show rectifying behavior characteristic of a p-n junction diode, thus confirming that as-grown polyacetylene is p type. From C-V characteristics we infer a residual acceptor concentration in as-grown films of p-(CH)/sub x/ of N/sub A/≃2 x 10^{18} cm^{-3}. Depletion has been studied in the polymer by using CdS of different doping concentrations. Detailed studies of the photovoltaic response at energies below E/sub g/ for (CH)/sub x/ imply the existence of a meta-stable deep trap in the polymer with energy near the center of the gap. The threshold energy for pumping into this level provides an independent measurement of the energy gap, E/sub g/=1.45 eV.

32610 **Photovoltaic properties of ZnO/CdTe heterojunctions prepared by spray pyrolysis.** Aranovich, J.A.; Golmayo, D.; Fahrenbruch, A.L.; Bube, R.H. (Department of Materials Science and Engineering, Stanford University, Stanford, California 94305). *J. Appl. Phys.;* **51**: No. 8, 4260-4268(Aug 1980).

An extended investigation has been made of the electrical and photovoltaic properties of heterojunctions prepared by spray-pyrolysis deposition of thin ZnO films on single-crystal p-type CdTe. The

principal experimental variables were the substrate temperature and the postdeposition temperature for annealing in H_2. Under actual sunlight the optimum cell showed an open-circuit voltage of 0.54 V, a short-circuit current of 19.5 mA/cm², and a solar efficiency (referred to the active area) of 8.8%, the highest value obtained to date for an authentic heterojunction on CdTe. The nature of the forward transport mechanism has been investigated, and a tunneling model in which bulk and interface deep traps control the forward characteristics is shown to provide good correlation with the experimental data.

32611 Photoacoustic absorption measurements of optical materials and thin films. Rosencwaig, A.; Willis, J.B. (University of California, Lawrence Livermore Laboratory, Livermore, California 94550). W-7405-ENG-48. *J. Appl. Phys.;* **51**: No. 8, 4361-4364(Aug 1980).

We have developed two photoacoustic methods to perform low absorption measurements on optical components. One method can make measurements in the 10^{-4}—10^{-5} absorption range, while the other can be used down to the 10^{-6} range.

32612 Phonon-induced relaxation in excited optical states of trivalent neptunium in $LaCl_3$. Hessler, J.P.; Brundage, R.T.; Hegarty, J.; Yen, W.M. (Chemistry Division, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439). *Opt. Lett.;* **5**: No. 8, 348-350(Aug 1980).

The first known measurements of the temperature dependence of the homogeneous linewidth of optical transitions of an actinide ion are reported. The system studied is Np^{3+} in $LaCl_3$. The results are discussed in terms of one- and two-phonon processes. The magnitudes of the linewidths are comparable with those observed in lanthanide ions.

32613 Neutron scattering study of the pressure dependenceof short-range order in CsD_2PO_4. Youngblood, R.; Frazer, B.C.; Eckert, J.; Shirane, G. (Brookhaven National Laboratory, Upton, New York 11973). *Phys. Rev., B: Condens. Matter;* **22**: No. 1, 228-235(1 Jul 1980).

We present the results of a neutron scattering study of the pressure dependence of the order-disorder phase transition in CsD_2PO_4. In an earlier study, it was shown that the dominant interaction propagates along one-dimensional chains of disordered hydrogen bonds linking phosphate groups along the b direction. In the absence of applied pressure, the interchain ordering is ferroelectric; at high pressure, it is antiferroelectric. This is shown to arise from extremely small interactions along the a direction between correlated b-c planes; with increasing pressure, these effective interactions change character so as to favor an antiferroelectric stacking of ferroelectric planes, resulting in a doubling of the unit cell along a. Interchain and intrachain couplings are inferred from a comparison of the diffuse scattering data with the predictions of a model based on weak coupling between one-dimensional chains. These results are compared with those obtained in a recent study of the dielectric behavior.

32614 Swelling-induced stresses in ion-bombarded surfaces: Effect of crystalline orientation. Wolfer, W.G. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering); Garner, F.A. (Westinghouse Hanford Co., Richland, WA (USA)). *J. Nucl. Mater.;* **85**: No. 86, 583-589(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

The state of stress in ion-bombarded specimens is analysed. The magnitude of the lateral compressive stresses is shown to depend on the ratio of the swelling rate to the creep rate compliance. The latter is given for three different mechanisms of irradiation creep in facecentered cubic crystals. Due to the dependence of the creep compliance on the crystal orientation, the lateral stresses in a given grain depend on its orientation with respect to the specimen surface. Detailed results are presented of the state of stress as a function of the grain orientation for all three irradiation creep mechanisms. These results are discussed in the context of blistering and step-height measurements.

32615 Thermomodulation of the Li K core excitons in LiF. Olson, C.G.; Lynch, D.W. (Iowa State Univ., Ames). *Solid State Commun.;* **31**: 51-54(1979).

Thermotransmission measurements of the Li K threshold spectrum of LiF clearly resolve the forbidden and the allowed exciton. The line shapes show that the former grows in intensity with increasing temperature, becoming allowed as phonons of odd symetry make the parity selection rule weaker, while the latter shifts to lower energy with increasing temperature. A second member of the forbidden exciton series has been resolved.

32616 Chemical diffusivity of lithium in Li/sub x/TaS_2 and Li/sub x/TiS_2 at 30°C. Basu, S. (Bell Labs., Murray Hill, NJ); Worrell, W.L. Contract EG-5-02-4356. pp 149-152 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

The chemical diffusivity of lithium in Li/sub x/TaS_2 and Li/sub x/TiS_2 ($0 < x < 1$) was determined at 30°C by a current-pulse relaxation technique in an electrochemical cell: (Li/Li^+ ($LiClO_4$ in propylene carbonate)/Li/sub x/MS_2(M = Ta and Ti) ...) Lithium was injected into or removed from the cathode by constant current-pulse (~ mA) for short times (3 to 13 secs). THe chemical diffusivity of lithium was calculated from the decay rate of the transient voltage. The chemical diffusivity of lithium in Li/sub x/TiS_2 is 5×10^{-9} cm²/sec over the entire composition range. The chemical diffusivity of lithium in Li/sub x/TaS_2 is composition dependent, and the average value is 1.8×10^{-8} cm²/sec in the composition range of $0.25 < x < 0.75$ at 30°C.

32617 Conductivity mechanisms in the superionic phases of AgI and Ag_2S as determined by neutron diffraction. Cava, R.J. (National Bureau of Standards, Washington, DC); Reidinger, F.; Wuensch, B.J. pp 217-220 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Both αAgI and βAg_2S have a BCC anion array. Neutron diffraction experiments indicate that silver ion transport in αAgI is characterized by continuous independent ion motion between nearest neighbor tetrahedral sites, whereas that in βAg_2S is dominated by silver-silver interaction. The differences are attributed to mobile ion concentration and cation-anion bonding characteristics.

32618 Physical and chemical properties of copper β-alumina. Little, J.A.; Fray, D.J. (Cambridge Univ., England). pp 323-327 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Sodium β-alumina exhibits ion exchange with the cations of many molten salts. Copper (I) β-alumina has been prepared by the electrolysis of a molten cuprous chloride plus copper mixture across a single phase sodium β-alumina. The resulting β-alumina was characterized for lattice parameters and phase content using an x-ray method and both the ionic and electronic conductivities were measured using both solid and molten salt electrodes. An e.m.f. technique, incorporating the copper β-alumina solid electrolyte, was then used to measure the thermodynamics of the copper and tin solutions of copper-tin alloys in the range 800°K to 1100°K in the mole fraction range X/sub Cu/ = 0.17 to X/sub Cu/ = 0.74. The results obtained were in excellent agreement with previous determinations.

32619 Correlation effects in diffusion in nonstoichiometric β''-alumina. Wolf, D. (Argonne National Lab., IL). pp 341-344 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

The effect of interactions between point defects on the correlated diffusive motion of atoms in nonstoichiometric crystals is investigated. The combination of Haven-ratio and isotope-effect measurements might enable one to determine the so-called charge correlation factor associated with correlated defect motions in the diffusion process. The Haven ratio (which is practically unaffected by defect-defect interactions) is calculated for the diffusion via single vacancies in the conduction planes of β''-alumina. Results obtained from an extension of the encounter model to nonstoichiometric crystals are in reasonable agreement with the computer-simulation results of Murch and Thorn.

32620 Evaluation of cation distribution in Li/Na β-alumina from first-order quadrupolar NMR spectra. Highe, A.; Vaughan, R.W. (California Inst. of Tech., Pasadena, CA). pp 375-378 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

This paper reports results of low- and intermediate-temperature measurements of the quadrupole interactions in single crystals of lithium-exchanged sodium β-alumina. Interpretation of the low-temperature data (~ 85°K) indicates that the lithium motion is effectively frozen out and the presence of three independent EFG tensors can be identified. These tensors are independent of lithium exchange and have been correlated with theoretical tensors calculated for various sites in β-alumina. Samples with different exchange concentrations differ in their relative population of sites. In addition,

intermediate temperature data are allowing detailed characterization of the lithium motion among these sites.

32621 Effect of pressure and composition on fast Na^+-ion transport in the system Na/sub 1+x/Zr$_2$Si/sub x/P/sub 3-x/O$_{12}$. Kafalas, J.A.; Cava, R.J. (Massachusetts Inst. of Tech., Lexington). pp 419-422 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Very high Na^+-ion conductivities have been observed in the system Na/sub 1+x/Zr$_2$ Si/sub x/P/sub 3-x/O$_{12}$. For example, the conductivity of NASICON ($Na_3Zr_2Si_2PO_{12}$) is 0.4 Ω^{-1} cm^{-1} at 300°C. The materials in the system are solid solutions varying continuously in composition over the range $0 \leqq x \leqq 3$. The effect of hydrostatic pressure (to 7 kbar) and composition on ionic conductivity were measured for a series of ceramic specimens with densities exceeding 95% of theoretical. The conductivity decreases with pressure, with a dependence corresponding to a positive activation volume. This volume decreases as x increases, indicating an increase in bottleneck size with increasing x. This change is consistent with the effect of composition on conductivity, which exhibits a broad maximum for x of 1.8 to 2.4, increasing slightly as x increases over this range although the concentration of vacant Na^+ positions decreases by 50%.

32622 Crystal structure and ionic conductivity of a new superionic conductor, $Na_3Sc_2P_3O_{12}$. Hong, H.Y.P. (Massachusetts Inst. of Tech., Lexington). pp 431-433 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

A new superionic conductor, $Na_3Sc_2P_3O_{12}$, has been synthesized by solid state reaction and by crystallization from a $Na_4P_2O_7$-rich flux. THe compound exists in two forms. Flux-grown material consists largely of a phase that is isostructural with NASICON ($Na_3Zr_2Si_2PO_{12}$). A detailed structure determination of this phase has been performed by single-crystal x-ray diffraction analysis. Solid state reaction yields the other phase, which has recently been obtained independently elsewhere. Both phases have structures consisting of a rigid three-dimensional network and interstitial Na^+ ions, but the networks are mirror images of each other and the Na^+ ions are differently distributed. The ionic resistivity of a $Na_3Sc_2P_3O_{12}$ pellet with 93% of theoretical density, prepared from material synthesized by solid state reaction, was determined to be 6 Ω cm at 300°C, with an activation energy of 0.19 eV between 150 and 300°C.

32623 Structure analysis of $Na_4Zr_2Si_3O_{12}$ at 300°C and 600°C. Tranqui, D. (CNRS, Grenoble, France); Capponi, J.J.; Joubert, J.C.; Shannon, R.D.; Johnson, C.K. pp 439-442 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Structure refinements of ionic conductor $Na_4Zr_2Si_3O_{12}$ were performed at RT, 300°C to 600°C. Analysis of the interatomic distances and bond angles show that very little change occurs in the $(Zr_2Si_3O_{12})^{4-}$ framework. Comparison of the electron density maps show that at high temperature, a significant decrease of the occupancy of the Na (2) sites is accompanied by several residual peaks in the passage region between Na (2) and Na (2). In spite of the fact that a strong correlation between the occupancy and temperature factors was observed, and the fact that harmonic thermal parameters might not be adequate to describe the large thermal motion of Na(2), we still found strong evidence that the 3 dimensional mobility of Na cations is mainly due to the direct passage of Na between the neighboring Na(2) sites.

32624 Analysis of the alternating current properties of LISICON ceramics. Bayard, M.L. (Massachusetts Inst. of Tech., Lexington). pp 479-482 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

The ionic conductivity of polycrystalline ceramic pellets of LISICON ($Li_{14}Zn(GeO_4)_4$) has been determined over the temperature range from 298 to 573°K by complex impedance measurements at frequencies from 5 Hz to 108 MHz. For temperatures up to 460°K the grain and intergrain contributions to the ceramic conductivity have been separated and their activation energies (0.89 to 0.76 eV, respectively) have been determined. The measured ceramic conductivity decreases markedly with increasing time of exposure to air at room temperature. This change can be attributed to the moisture sensitivity of the intergrain regions. The highest measured ceramic conductivity at 300°C, which was determined immediately after sintering, is 0.1 Ω^{-1}cm^{-1}, in good agreement with the value reported by Hong and nearly an order of magnitude higher than that reported by von Alpen et.al.

32625 Mixed ionic and electronic transport in thoria electrolytes. Fujimoto, H.H.; Tuller, H.L. (Massachusetts Inst. of Tech., Cambridge). pp 649-652 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Thoria (ThO_2) is one of a number of oxides exhibiting fast oxygen ion transport at elevated temperature when doped with lower valent cations. Except for P/sub O_2/'s $\sim > 10^{-5}$ atm, ionic conduction predominates down to very low P/sub O_2/'s making it the material of choice for oxygen sensors operating under highly reduced conditions. A series of electrical conductivity and ionic transport measurements have been performed on ThO_2 doped with variable valent Ce (+3,4) to obtain desired electronic formation and transport data and to test the hypothesis that variable valent impurities limit the applicabilty of such probes. Increasing levels of Ce lead to increasingly large n-type regions at reduced P/sub O_2/'s at the expense of the ionic conductivity plateau. Analysis indicates that, in contrast to conventional wisdom, the P/sub O_2/ dependent conduction is predominantly ionic rather than electronic. Consequences of this model are discussed.

32626 Oxygen-ion conductivity and defect structure of CeO_2 doped with CaO and Y_2O_3. Nowick, A.S.; Wang, D.Y.; Park, D.S.; Griffith, J. (Columbia Univ., New York, NY). pp 673-677 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

In order to study the nature of defects in fluorite-type oxides, the ac ionic conductivity, σ, of CeO_2 doped with CaO or Y_2O_3 has been investigated over a wide concentration range. The true lattice conductivity was separately obtained by using complex impedance analysis. In the case of CaO doping, the predominant defect at low concentrations is the nn Ca-V_0 pair. For Y_2O_3 doping, pairs are also formed, but there are additional interaction effects with residual Y^{3+} ions which cause large changes in both σ and the activation enthalpy as functions of concentration.

32627 Electrical conductivity in ceramic solid solutions of ZrO_2-$LnO_{1.5}$ with Ln = Gd, Nd. de Vries, K.J.; van Dijk, T.; Burggraaf, A.J. (Univ. of Tech., Netherlands). pp 679-682 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Electrical conductivity (CA) and EMF measurements are carried out in ceramic compositions of Gd/sub x/Zr/sub 1-x/O/sub 2-x/2/ and Nd/sub x/Zr/sub 1-x/O/sub 2-x/2/. Mixed conduction is found only in the latter system above about x = 0.5. Bulk and grain boundary conductivities are separated. The main result is that in both systems Q/sub act/ decreases in the composition range towards the stoichiometric ordered pyrochlore $Ln_2Zr_2O_7$. This decrease is accompanied by a decrease in σ_0. The latter effect is most strongly in the Nd-systems. Single crystal measurements show that ordered samples also have a higher conductivity than disordered ones.

32628 Magnetic tagging of ion diffusion in PbF_2. Hogg, R.D.; Vernon, S.P.; Jaccarino, V. (Univ. of California, Santa Barbara). pp 697-699 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Our initial study of the effects of paramagnetic impurities on the line-width of the F^{19} NMR in Mn-doped PbF_2 has been extended to include pulsed measurements of the longitudinal $(1/T_1)^{19}$ and transverse $(1/T_2)^{19}$ relaxation rates. The frequency and Mn concentration dependence of $(1/T_1)^{19}$ have been studied as a function of temperature and a comparison is made with the recent theory of Richards. While certain qualitative agreement is found, it is clear that a more detailed model of the ion-hopping process is needed to accurately describe the experimental results.

32629 High proton conductivity in compounds in the hydrogen-uranyl-periodate-water system. Shilton, M.G.; Howe, A.T. (Univ. of Leeds, England). pp 727-730 of Fast ion transport in solids: electrodes and electrolytes. Vashishta, P.; Mundy, J.N.; Shenoy, G.K. (eds.). New York, NY; Elsevier North Holland, Inc. (1979).

From Fast ion transport in solids-electrode and electrolytes conference; Lake Geneva, WI, USA (21 May 1979).

Conductivity studies of phases in the hydrogen-uranyl-periodate-water system have shown some of them to have comparable conductivities to the good proton conductors hydrogen uranyl phosphate and arsenate tetrahydrates. Phases have been prepared of general formula H/sub 5n-2/$UO_2(IO_6)$/sub n/.$4H_2O$ in the composition range n = 0.5 to 2.0, and two crystalline phases have been found which have the approximate compositions $H(UO_2)_2IO_6.8H_2O$ and $H_8UO_2(IO_6)_2.4H_2O$, the latter having a high conductivity of approximately 0.7 $ohm^{-1}\ m^{-1}$ at 293°K. At intermediate compositions with n = 1 to 2, noncrystalline glassy phases may be produced, some of which have conductivities above 0.1 $ohm^{-1}\ m^{-1}$ at 293°K. They can easily be fabricated into thin flexible adherent films suitable for solid electrolyte applications.

CHEMISTRY

32630 (CONF-800380—) **Third international trade exhibition and congress for oil, gas, chemical and process engineering industries.** (Tata Energy Research Inst., Bombay (India)). 1980. 64p. NTIS (US Sales Only), PC A04/MF A01.

From 3. international trade exhibition and congress for oil, gas, chemical and process engineering industries; Bombay, India (16 Mar 1980).

Emphasis in this conference was on energy aspects, particularly in India. Separate abstracts were prepared for eight of the nine papers include in this volume. (DLC)

ANALYTICAL AND SEPARATIONS CHEMISTRY

REFER ALSO TO CITATION(S) 31495, 31528, 32198

32631 (BNL—28105) **Analyses of fine paste ceramics.** Sabloff, J.A. (ed.). (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 231p. NTIS, PC A11/MF A01.

Four chapters are included: history of Brookhaven fine paste ceramics project, chemical and mathematical procedures employed in Mayan fine paste ceramics project, and compositional and archaeological perspectives on the Mayan fine paste ceramics. (DLC)

32632 (RFP—2909) **Quality engineering and control. Semiannual progress report, November-December 1978, January-April 1979.** Carpenter, R.L. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 2 Aug 1980. Contract AC04-76DP03533. 38p. NTIS, PC A03/MF A01.

This document reports the following: atomic absorption spectroscopy of Ir in Pu-Ir alloys; removal of Pu from soil; surface microanalysis using elemental x-ray mapping; microscopic scanning of Ga in Pu; microscopy of defects in Pu; emission spectroscopy of Ir and Y in PuO_2; gas chromatograhy of PCB's in transformer oils and water; liquid chromatography of chlorophenoxy acid herbicides in water; solution analysis by spark source mass spectrometry; a portable gas sampling system; flammability testing of HEPA filter materials; identification of Nomex and Kapton in fiberglass filters; bromine in Be density problem; x-ray fluorescence of Nb in U-Nb alloys; reactions in Pu-nitric acid-ethylene glycol; gas-fusion analysis of oxygen in chromium; analysis of sulfate and chloride in water-soluble oils; and decontamination of surface coatings. (DLC)

32633 (RFP—3015) **Quality engineering and control. Semiannual progress report, May-October 1979.** Carpenter, R.L. (Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant). 19 Aug 1980. Contract AC04-76DP03533. 34p. NTIS, PC A03/MF A01.

The following are reported: colorimetric determination of Ti in Cr, decontamination of metals by anodic dissolution, computer code for x-ray peak identification, gel-permeation chromatography of CoRezyn 1664 polyester resin, infrared monitoring of gases and vapors, particle size analysis of dusts, nondestructive analysis of Oralloy for removable alpha contamination, dissolution (digestion) of high-fired oxides, assay of U in a Pu-U alloy, measurement of oxide thickness on Pu metal by x-ray diffraction, analysis of precipitated Pu peroxide, differentiation of Dowex SBR and 11 resins, and determination of Pu solubility in simulated lung fluid. (DLC)

32634 (UCID—15644-80-1) **General chemistry division quarterly report, January-March 1980.** Harrar, J.E.; Hasbrouck, M.E. (eds.). (California Univ., Livermore (USA). Lawrence Livermore Lab.). 7 May 1980. Contract W-7405-ENG-48. 28p. NTIS, PC A03/MF A01.

Analytical developments for the nuclear explosives programs include: the coupling of several analytical instruments, a MS inlet for on-line cryogenic separation, a cold electron-impact ion source, calibration of a light-isotope mass spectrometer, far-infrared laser development, characteristics of mode-locked krypton-ion laser, photoelectrochemical flash experiments, analysis of chemical explosives, GC-IR analysis of the perfluorocarbon FC-86, and a scintillation detector for measuring tritium. In the energy programs, a procedure was developed for determining thallium in zeolites by controlled-potential coulometry. Special projects were: use of laser-induced fluorescence with HPLC for analysis of PAHs in fly ash, removal of fluoride from geothermal water, and automation of mass spectrometer. (DLC)

ACTIVATION AND NUCLEAR REACTION PROCEDURES

REFER ALSO TO CITATION(S) 31480, 31622, 31623

32635 **High-precision chemical characterization of major obsidian sources in Guatemala.** Asaro, F. (Univ. of California, Berkeley); Michel, H.V.; Sidrys, R.; Stross, F. *Am. Antiq.;* **43**: No. 3, 436-443(Jul 1978).

The important Mesoamerican obsidian source El Chayal has been carefully explored and sampled. Forty new source specimens have been subjected to neutron activation analysis, and the composition patterns are recorded and compared. The westernmost of the known Guatemalan obsidian sources, Tajamulco, has also been studied. Precise analytical data are also reported for the important Ixtepeque and Rio Pixcaya sources. In addition, the complete analytical data for a group of artifacts in Belize excavated by Norman Hammond are reported and compared with the source compositions. The establishment in the literature of a library of collection of precise and intercomparable composition data for the sources of this general region is suggested, and the present paper is offered as a first contribution toward this objective. 7 tables.

CHEMICAL PROCEDURES

REFER ALSO TO CITATION(S) 31524, 32770

32636 **Gas chromatography with detection by laser excited resonance enhanced 2-photon photoionization.** Klimcak, C.M.; Wessel, J.E. (Aerospace Corp., Los Angeles, CA). Contract DE-AC03-79EV10239. *Anal. Chem.;* **52**: No. 8, 1233-1239(Jul 1980).

Resonance enhanced 2-photon photoionization has been applied to detection of gas chromatograph effluents using a small volume proportional counter cell and a low power laser. Detection limits on the order of 10 picograms were obtained for the aromatic hydrocarbons anthracene, phenanthrene, benzanthracene, acenaphthene, naphthalene, and assorted halonaphthalenes. Spectral differentiation between coeluting anthracene and phenanthrene was also demonstrated. The influence of excitation pulse duration was investigated. 10 figures, 2 tables.s

32637 (LA—8349) **Selective two-step titration of thorium by sulfate displacement of the diethylenetriaminepentaacetic acid complex.** Kiefer, P. (Los Alamos Scientific Lab., NM (USA)). Jul 1980. Contract W-7405-ENG-36. 9p. NTIS, PC A02/MF A01.

Thorium and other metals are complexed with excess diethylenetriaminepentaacetic acid (DTPA) at pH 1.4, the excess DTPA is titrated with Bi(III) to a xylenol orange end point, sulfate is added to complex Th(IV), and the displaced DTPA again is titrated with Bi(III). Of 61 metal ions and nonmetal anions tested, only Ga(III), Sc(III), tungstate, citrate, oxalate, and thiosulfate interfere seriously. Lesser interferences are In(III), Zr(IV), V(IV), and permanganate. The standard deviation is 2 μg for 56 to 840 μg Th.

32638 **Determination of benzo[a]pyrene in petroleum substitutes.** Tomkins, B.A.; Kubota, H.; Griest, W.H.; Caton, J.E.; Clark, B.R.; Guerin, M.R. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *Anal. Chem.;* **52**: No. 8, 1331-1334(Jul 1980).

The unambiguous determination of trace levels of benzo[a]pyrene (BaP) in complex matrices requires considerable chemical isolation and spectroscopic or chromatographic evidence to ensure freedom from interferences. Examination of BaP isolates prepared from petroleum substitutes by liquid-liquid partitioning and adsorption/partition column chromatography or by more extensive column chromatography alone indicates an unambiguous determination of BaP in the range of 10^{-2} to 10^{3} μg/g with a precision of better than +-10%. Results obtained with such methodology may be used to evaluate and validate more rapid analytical procedures. 2 figures, 1 table.

32639 **Method for the determination of polycyclic aromatic hydrocarbons in animal tissue.** Mitchell, C.E. (Inhalation Toxicology Research Inst., Albuquerque, NM). *Bull. Environ. Contam. Toxicol.;* **23**: No. 4/5, 669-676(Nov 1979).

The present paper describes a method that has been used for the isolation and analysis of polycyclic aromatic hydrocarbons in air, water, soil and biological samples. All organic solvents and chemicals were analytical reagent grade and were used without any further purification. Fritted glass thimbles were used with the Soxhlet extractors.

RADIOMETRIC AND RADIOCHEMICAL PROCEDURES

REFER ALSO TO CITATION(S) 31693, 31711, 32813

32640 Wet oxidation of polystyrene filters in the determination of polonium-210. Sill, C.W. (Dept. of Energy, Idaho Falls, ID). *Anal. Chem.;* **52**: No. 8, 1383-1385(1980).

The determination of extremely low levels of radioactive substances in the atmosphere requires a filter capable of sustaining high flow rates for long periods of time while giving high retentivity for submicron particles. The most desirable filters are made from glass or polystyrene fibers. The method described here gives complete recovery of polonium. Polystyrene is so difficult to wet-ash directly without charring that little or no reaction occurs unless the full power of 72% perchloric acid at high temperature is applied. Limit the polystyrene oxidized at 1 time to a single 4-inch filter containing not more than 1.5g. Use at least 50 ml of concentrated sulfuric acid to provide sufficient heat capacity to accommodate the heat liberated, and a 1-L beaker to provide a large surface-to-volume ratio to dissipate the heat produced as rapidly as possible. The analysis included mixing concentrated sulfuric acid, concentrated nitric acid, and perchloric acid. The procedure described is intended for the determination of ^{210}Po only; however, other long-lived α emitters can be determined simultaneously with that of ^{210}Po. (DP)

SPECTRAL PROCEDURES

REFER ALSO TO CITATION(S) 31480, 31521, 32638

32641 (LA-UR—80-2076) **Some laser techniques for chemical detection.** Sander, R.K.; Buchwald, M.I. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 10p. (CONF-8004104—1). NTIS, PC A02/MF A01.

From Symposium on toxic substance control decontamination; Columbus, OH, USA (22 Apr 1980).

Spectroscopy provides a fast sensitive method for chemical analysis. Lasers are high intensity narrow bandwidth, collimated light sources in the infrared, visible, and ultraviolet spectral regions. Wavelength tunable lasers can be used for spectroscopic chemical identification by means of techniques such as opto-acoustic spectroscopy, thermal lensing, and fluorescence excitation. These methods all share the useful characteristic that their detection sensitivity to small quantities of chemicals improves with higher laser intensity. We have developed apparatuses to use these techniques for trace chemical identification and detection. In addition, a useful improvement to thermal lensing, which we designate thermal deflection spectroscopy, has been developed.

32642 Fortran programs to acquire and process isotopic mass spectrometric data: a conceptual description. Smith, D.H. (Oak Ridge National Lab., TN). *Chem., Biomed., Environ. Instrum.;* **10**: No. 1, 27-35(1980).

New FORTRAN computer programs have been written to process isotopic mass spectrometric data. A major goal of these programs was to achieve maximum flexibility in all phases of the analytical process: data acquisition, data processing, and report writing. Magnetic disk files are exploited to this end. The programs can acquire and process data from any element taken under any scanning scheme and with any desired ratios calculated. Results are stored on magnetic disks and results of similar samples can be listed in a single compact report. 1 table.

32643 Determination of fission product elements in light water reactor (LWR) and experimental breeder reactor (EBR) dissolver solutions by spark source mass spectrometry. Franklin, J.C.; Landau, L.; Carter, J.A. (Oak Ridge National Lab., TN (USA)). *Radiochem. Radioanal. Lett.;* **41**: No. 3, 217-224(26 Nov 1979).

A method for the determination of fission product elements and isotopically natural impurity elements, in reactor dissolver solutions, has been developed and applied to the analysis of 700 day (LWR) and 1000 day (EBR) cooled dissolver solutions. This method combines the use of isotope dilution for selection fission product elements, and of internal standards to monitor dilution stages, and concentrations of various non-isotope diluted elements. The concentrations ranged from about 10μgml^{-1} to about 1000 μgml^{-1} in the original dissolver solution.

SEPARATION PROCEDURES

REFER ALSO TO CITATION(S) 32829

32644 (IS-M—281) **Chemically based synergic solvent extraction model for the system Nd(NO$_3$)$_3$-HDEHP-TBP-benzene.** Hoh, Y.C.; Lee, M.C.; Bautista, R.G. (Ames Lab., IA (USA)). 1980. Contract W-7405-ENG-82. 8p. (CONF-800918—1). NTIS, PC A02/MF A01.

From International solvent extraction conference; Liege, Belgium (6 Sep 1980).

A chemically based synergic solvent extraction model has been developed for the system Nd(NO$_3$)$_3$-HDEHP-TBP-benzene. The model equation for the distribution ratio can be written as D/sub c/ = K_1 a_0((HG)$_2$)/sub O^3/(TBP)O^3(H$^+$)/sub A^{-3}/, where K_1 is the effective equilibrium constant containing the quotient of the activity coefficients of the reacting species and a_0 is the degree of formation of the neodymium complex in the equilibrated aqueous phase. ((HG)$_2$)$_0$, (TBP)$_0$, and (H$^+$)/sub A/ denote the equilibrated HDEHP, TBP, and aqueous hydrogen ion concentrations, respectively. Experimental equilibrium distribution data generated in this work were used to test the model equation. Correlation coefficients between the experimental data and the predicted values are in the range of 0.899 to 0.983.

32645 Actinide extractants: development, comparison, and future. Shoun, R.R.; McDowell, W.J. (Oak Ridge National Lab., TN). Contract W-7406-ENG-26. pp 71-87 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

The history of the discovery and development of organic extractants for actinides is surveyed. The extraction chemistry of coordinative and cation exchange extractants is examined and their characteristics compared. These extractants include monodentate and bidentate phosphate compounds, alkyl ammonium compounds, sulfoxides, alkyl phosphoric acids, sulfonic acids, diketones, and synergistic mixtures. The possible development of new, improved extractants is discussed. 95 references. (DLC)

32646 Solvent extraction of transplutonium elements from acid solutions by polydentate neutral organophosphorus compounds and from alkaline solutions by quaternary ammonium bases and by alkylpyrocatechols. Myasoedov, B.F.; Chmutova, M.K.; Karalova, Z.K. (Inst. of Geochemistry and Analytical Chemistry, Moscow). pp 101-115 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

Polydentate organophosphorus compounds appear to be efficient extractants of trivalent transplutonics (TPE) from acidic solutions. Full-scale use of these compounds in TPE extraction from nuclear acidic waste solutions seems likely in the future. It may be possible to develop highly selective extractants capable of TPE separation from each other as well as from rare earth elements. Some of the reagents described may be used for extraction chromatography separation of certain TPE whose separation factors are high enough. Studies have shown that in the presence of complex-forming agents, actinides and lanthanides can be extracted from alkaline solution by using aliquat 336 and 4 (α,α-dioctylethyl)pyrocatechol, preferably the latter.

32647 Properties and uses of nitrogen and sulfur donors ligands in actinide separations. Musikas, C.; le Marois, G.; Fitoussi, R.; Cuillerdier, C. (Centre d'Etudes Nucleaires de Fontenay aux Roses, France). pp 131-145 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

Investigations of complexes of 5f ions and 4f ions with nitrogen donor ligands show that trivalent actinide ions are more strongly complexed than trivalent lanthanide ions, and these properties can be exploited in actinide-lanthanide group separation by the choice of appropriate extraction systems. The higher affinity of nitrogen ligand for 5f trivalent ions is not attributable to the occurence of different type of complex for the two series (inner vs outer sphere), as shown by the use of several complexation techniques. This difference might be attributed to greater covalent bond contributions in the actinide complexes. Dialkyldithiophosphates can be better extractants than their dialkylphosphate equivalents, as shown by the synergistic extraction of U (VI) from concentrated phosphoric acid. This effect is probably due to the weaker hydrogen bonds of the P group which allow the formation of a greater variety of extracted species. In this particular case, we showed that the extracted species has the formula: UO_2 (H_2PO_4) (R_3PO) (DEHDTP).

32648 Application of photochemical techniques to actinide separation processes. Depoorter, G.L.; Rofer-Depoorter, C.K. (Los Alamos Scientific Lab., NM). Contract W-7405-ENG-36. pp 267-276 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

This paper reviews the application of photochemical techniques to actinide separations and related photochemical processes. Studies in this field are still in the research stage, but the potential is enormous. 28 references. (DLC)

INORGANIC AND PHYSICAL CHEMISTRY

CHEMICAL AND PHYSICOCHEMICAL PROPERTIES

REFER ALSO TO CITATION(S) 31673, 32658, 32664, 32672, 32693, 33163

32649 (IS-T—902) **Modelling of solid-gas reactions with application to the chlorination of lime.** Yake, D.E. (Ames Lab., IA (USA)). Aug 1980. Contract W-7405-ENG-82. 181p. NTIS, PC A09/MF A01.

Thesis.

Solid-gas reactions are an integral part of many chemical processes including metal refining, solid fuel combustion, and environmental control. These complex reactions occur in basically the same way with the overall reaction in each case consisting of a series of steps involving gas-phase mass transfer to the external solid surface, pore diffusion within the solid, and finally adsorption/desorption and chemical reaction. While these steps are similar to those of heterogeneous catalytic reactions, the analysis of noncatalytic solid-gas reactions is complicated by the continuous change in the solid structure which often occurs during reaction. This research effort has been focused on the development and analysis of improved solid-gas reaction models (grain model type) that adequately explain the trends exhibited by the data from the chlorination of lime. A thorough kinetic investigation of this reaction system was carried out using a thermogravimetric analysis technique, in addition to scanning electron microscopy, electron microprobe, mercury penetration porosimetry and x-ray powder diffraction analyses. More specifically, the intrinsic activation energy of the reaction and the kinetic order of the reaction with respect to chlorine have been determined.

32650 (LBL—10729) **In situ observations of gas/solid reactions.** De Jonghe, L.C. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Apr 1980. Contract W-7405-ENG-48. 11p. (CONF-800903—1). NTIS, PC A02/MF A01.

From 6. international conference on high voltage microscopy; Antwerp, Belgium (1 Sep 1980).

The early stages of the gaseous reduction of a ceramic oxide alloy, cobalt ferrite, have been observed by HVTEM in situ. Cobalt metal was preferentially removed and the divalent iron was injected into the matrix. This led to the formation of a coherent wuestite phase. The metal phase was observed to lose coherency as it moved with the advancing metal/oxide interface. Some limitations of the in situ observations were discussed.

32651 **Are there hot carriers in liquid Ar, Kr, and Xe.** Ascarelli, G. (Purdue Univ., West Lafayette, IN). Contract DE-AC02-79ER10375.A000. *J. Phys. Chem.;* **84**: No. 10, 1193-1196(15 May 1980).

It is shown that the saturation of the drift mobility observed in liquid Ar, Kr, Xe, and other insulating liquids is not a hot electron effect but can instead be understood as an effect due to shallow traps. Estimates of the binding energy of such traps in Ar indicate a value ~ 90 MeV. The effect of the addition of impurities can be understood as enhancing a Schottky ionization process.

32652 **Symmetry properties of the transport coefficients of charged particles in disordered materials.** Baird, J.K. (Oak Ridge National Lab., TN). Contract W-7405-ENG-26. *J. Phys. Chem.;* **84**: No. 10, 1258-1259(15 May 1980).

The transport coefficients of a charged particle in an isotropic material are shown to be even functions of the applied electric field. The limitation which this result and its consequences place upon formulae used to represent these coefficients is discussed.

32653 **Activation energies for an intramolecular electron transfer reaction.** Beitz, J.V. (Argonne National Lab., IL); Miller, J.R.; Cohen, H.; Wieghardt, K.; Meyerstein, D. *Inorg. Chem.;* **19**: No. 4, 966-968(Apr 1980).

Activation energies and solvent effects for the intramolecular electron transfer reaction from a ligated p-nitrobenzoate radical anion to a cobalt(III) center in the complexes formed by the reduction of I and II were measured. The rate of the intramolecular electron transfer reaction decreases with increasing solvent polarity. The activation energies range between 9.0 and 12.5 kcal/mol for complex I and between 13.3 and 19.5 kcal/mol for complex II. The rates always followed Arrhenius temperature dependence, even with 10^4 changes in rate from room temperature to 203 K. Very large preexponential factors, 2×10^{11} - 10^{18} s^{-1}, are calculated for these rate constants.

32654 **Vibrational relaxation of HF($v = 3,4$).** Douglas, D.J.; Moore, C.B. (Univ. of California, Berkeley). *Chem. Phys. Lett.;* **57**: No. 4, 485-489(15 Aug 1978).

The vibrational relaxation of pure HF($v = 3$ and $v = 4$) has been studied by pumping HF directly from $v = 0$ to $v = 4$. The relaxation rates of $v = 3$ and $v = 4$ were determined to be k/sub T/$^3 = (2.8 +- 0.4) \times 10^{-11}$ cm^3 molecule^{-1} s^{-1} and k/sub T/$^4 = (7.2 +- 0.5) \times 10^{-11}$ cm^3 molecule^{-1} s^{-1} at 293°K. It is shown that single quantum energy transfer can account for all of the vibrational relaxation. 2 figures, 2 tables

32655 **Compensation for integerization errors in simulated EPR spectra.** Forman, A.; Borg, D.C. (Brookhaven National Lab., Upton, NY). Contract EY-76-C-02-0016. *J. Magn. Resonance;* **31**: 311-313(1978).

EPR spectra of free radicals can be simulated in a digital computer array from a lineshape function and a series of spectral lines. When their spacings do not coincide with those represented by an integral number of array locations, errors in the spectral envelope may result.

ORGANIC CHEMISTRY

CHEMICAL AND PHYSICOCHEMICAL PROPERTIES

REFER ALSO TO CITATION(S) 31575, 31729, 32653, 32664

32656 (DOE/ER/05563—3) **Applications of functionalized polymers in catalysis. Progress report 3, July 15, 1979-July 1, 1980.** Bergbreiter, D.E. (Texas A and M Univ., College Station (USA). Research Foundation). 1 Jul 1980. Contract AS05-77ER05563. 18p. NTIS, PC A02/MF A01.

Research on applications of polymers in catalysis has encompassed three areas: the use of functionalized polymers to detect soluble intermediates in heterogeneous Group VIII metal catalyzed arene hydrogenations; a study of olefin isomerization and hydrogenations catalyzed by polystyrene supported bis(cyclopentadienyl)titanium dichloride and an alkylmagnesium halide; and the acceleration in rate of an olefin hydrogenation catalyzed by homogeneous rhodium and ruthenium complexes as a result of absorption of triphenylphosphine by silver (I) polystyrenesulfonate. The first project found that polymer bound trapping agents were unable to detect soluble intermediates such as dienes, free radicals, or reducing agents in platinum-catalyzed benzene hydrogenation at 60 psi H_2 and 30°C. The inability to detect diene intermediates was shown to be the result of the lower reactivity of the polymeric reagent versus an active catalyst. The polymer-supported titanium catalysts studied were unusual in that immobilization of a catalyst in this case altered the catalyst's specificity relative to its homogeneous counterpart. Preliminary results from the third project demonstrate the potential of simple functionalized polymers to improve existing homogeneously catalyzed reactions. Rate increases for olefin hydrogenations using $ClRh(Ph_3P)_3$, $HRh(CO)(Ph_3)_3$, $HRu(OAc)(Ph_3P)$, $H_2Ru(Ph_3P)_4$, $Cl_2Ru(Ph_3P)_3$, and $Cl_2Ru(Ph_3P)_4$ ranged from 25 to 3000%.

32657 (IS-T—888) **Adsorption of organic molecules at the mercury-solution interface: effect of anion specific adsorption on double layer properties.** Buckfelder, J.J. III. (Ames Lab., IA (USA)). Aug 1980. Contract W-7405-ENG-82. 122p. NTIS, PC A06/MF A01.

Thesis.

Adsorption of iso-pentanol, pentanoic acid, and benzyl alcohol at the mercury-solution interface was studied in $HClO_4$, H_2SO_4, $NaNO_3$, and NaF electrolytes. The Frumkin isotherm equation Ba $= (\theta/(1-\theta))\exp(2a\theta)$ together with the implied charge vs. surface excess relation: q = (1-θ)q/sub w/ + θQ were used to analyze the experimental data. Linear charge vs surface excess plots were obtained for the aliphatic compounds over the entire potential region studied; for benzyl alcohol, plots were linear only at anodic potentials. The slopes of these lines agreed with those predicted by the above equation, with Q = C/sub org/(V-V/sub n/), for cathodic potentials. At potentials anodic to the electrocapillary maximum, deviations between experimental and theoretical slopes appeared. In the model proposed, the double layer consists of two parts. The layer closest to the surface is restricted to water molecules and specifically adsorbed ions. The second layer contains organic molecules exclusively; any charge necessary to balance the surface charge is considered to be in a monolayer adjacent to the organic layer. From the slope of the charge vs surface excess plots, it is possible to calculate the charge on the covered portion of the surface and then calculate the amount of specific adsorption. The relative amounts of specific adsorption are in agreement with known strengths of adsorption of the anions of the electrolyte. Capacity curves were also calculated and were in good agreement with experimental curves.

32658 (LBL—10214) **Reactivity patterns of transition metal hydrides and alkyls.** Jones, W.D. II. (California Inst. of Tech., Pasadena (USA)). May 1979. Contract W-7405-ENG-48. 178p. NTIS, PC A09/MF A01.

Thesis.

The complex PPN^+ $CpV(CO)_3H^-$ (Cp=eta^5-C_5H_5 and PPN $= (Ph_3P)_2N$) was prepared in 70% yield and its physical properties

and chemical reactions investigated. PPN^+ $CpV(CO)_3H^-$ reacts with a wide range of organic halides. The organometallic products of these reactions are the vanadium halides $PPN^+[CpV(C)_3X]^-$ and in some cases the binuclear bridging hydride $PPN^+[CpV(CO)_3]_2H^-$. The borohydride salt $PPN^+[CpV(CO)_3BH_4]^-$ has also been prepared. The reaction between $CpV(CO)_3H^-$ and organic halides was investigated and compared with halide reductions carried out using tri-n-butyltin hydride. Results demonstrate that in almost all cases, the reduction reaction proceeds via free radical intermediates which are generated in a chain process, and are trapped by hydrogen transfer from $CpV(CO)_3H^-$. Sodium amalgam reduction of $CpRh(CO)_2$ or a mixture of $CpRh(CO)_2$ and $CpCo(CO)_2$ affords two new anions, PPN^+ $[Cp_2Rh_3(CO)_4]^-$ and $PPN^+[Cp_2RhCo(CO)_2]^-$. $CpMo(CO)_3H$ reacts with $CpMo(CO)_3R$ ($R=CH_3, C_2H_5, CH_2C_6H_5$) at 25 to 50°C to produce aldehyde RCHO and the dimers $[CpMo(CO)_3]_2$ and $[CpMo(CO)_2]_2$. In general, $CpV(CO)_3H^-$ appears to transfer a hydrogen atom to the metal radical anion formed in an electron transfer process, whereas $CpMo(CO)_3H$ transfers hydride in a 2-electron process to a vacant coordination site. The chemical consequences are that $CpV(CO)_3H^-$ generally reacts with metal alkyls to give alkanes via intermediate alkyl hydride species whereas $CpMo(CO)_3H$ reacts with metal alkyls to produce aldehyde, via an intermediate acyl hydride species.

32659 Temperature dependence of the fluorescence decay of acridine measured with picosecond techniques. Shapiro, S.L.; Winn, K.R. (University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *J. Chem. Phys.;* 73: No. 3, 1469-1470(1 Aug 1980).

The fluorescence lifetime of acridine is measured as a function of temperature in three solvents. Whether the solvent is protic or aprotic, the same activation energy is extrapolated for energy dissipation. These results are inconsistent with a model used to describe electronic relaxation in acridine that depends solely on the energy gap between electronic states.

32660 Intermolecular energy exchange as a mechanism for vibrational dephasing in polyatomic molecules. Harris, C.B.; Shelby, R.M.; Cornelius, P.A. (Univ. of California, Berkeley). *Chem. Phys. Lett.;* 57: No. 1, 8-14(1 Jul 1978).

Vibrational dephasing by intermolecular vibrational energy exchange is shown to be important for the case of polyatomic molecules in condensed phases. In this model, dephasing results from random modulation of the vibrational frequency due to exchange of energy by a low frequency mode. Analysis of the temperature dependence of Raman lineshapes in the intermediate exchange regime allows the determination of the parameters which characterize this dephasing process. These include the energy exchange rates, the amplitude of the modulation which is determined by intramolecular anharmonic coupling, and the effective activation energy for exchange. We outline the formalism and apply the theory to the C-H stretching vibrations of 1,2,4,5-tetramethylbenzene (durene) and find that these activation energies correspond to individual low frequency intramolecular vibrations. It is shown that different C-H stretching modes are dephased by different but specific low frequency modes in solid durene. 4 figures, 2 tables.

PHOTOCHEMISTRY

REFER ALSO TO CITATION(S) 31521, 31837, 31847, 32636

32661 (DOE/ER/01198—1306) **Light-induced electron transfer vs. energy transfer in molecular thin-film systems.** Renschler, C.L.; Faulkner, L.R. (Illinois Univ., Urbana (USA)). 1980. Contract AC02-76ER01198. 24p. (CONF-800905—1). NTIS, PC A02/MF A01.

From Photoelectrochemistry conference; Oxford, UK (8 Sep 1980).

Quenching of fluoranthene (FA) singlets by tetrabromo-o-benzoquinone (TBBQ) and N,N,N',N'-tetramethyl-p-phenylenediamine (TMPD) was studied both in xylene solutions and in spin-cast polystyrene (PS) films. Emphasis was placed on time-resolved fluorescence transients resulting from pulsed excitation. Linear Stern-Volmer plots were obtained for quenching in solution and gave diffusion-controlled rate constants, of 1.45×10^{10} M^{-1} sec^{-1} and 1.53×10^{10} M^{-1} sec^{-1} for TBBQ and TMPD, respectively. TBBQ was found to quench FA singlets in PS over the studied concentration range 12 mM < [TBBQ] < 48 mM, but in its presence FA singlets decayed nonexponentially. The results were interpreted quantitatively in terms of pure Foerster's transfer from FA to TBBQ without diffusion of excitons. The critical transfer radius R_0 was experimentally determined to be 24.3 A, which is in good agreement with the theoretical value of 23 A calculated from spectral data. Quenching of FA singlets in PS films was found to be independent of FA concentration over a 300 mM to 1200 mM FA concentration range for a constant TBBQ concentration of 24.0 mM. TMPD was only slightly effective as a quencher of FA singlets in PS because it apparently behaves strictly as a contact quencher based on reversible charge transfer. The implications of these results for the design of systems intended to exploit light-induced electron transfer are discussed.

32662 Laser purification of silane: impurity reduction to the sub-part-per-million level. Hartford, A. Jr.; Huber, E.J.; Lyman, J.L.; Clark, J.H. (Los Alamos Scientific Laboratory, Applied Photochemistry Division, P.O. Box 1663, Los Alamos, New Mexico 87545). W-7405;ENG. 36. *J. Appl. Phys.;* 51: No. 8, 4471-4474(Aug 1980).

Selective ultraviolet photolysis of AsH_3 and PH_3 impurities in SiH_4 has been employed to photochemically purify the SiH_4. At ambient temperature, initial impurity levels of 50 ppm each of AsH_3 and PH_3 in SiH_4 were reduced to less than 0.5 ppm upon irradiation with a 193-nm ArF excimer laser. Lowering the temperature at which the photolysis is carried out to below ambient results in a substantial reduction in the laser energy required for impurity removal.

32663 Laser photodetachment spectra of $C_6F_6^-$ in nonpolar liquids. Sowada, U.; Holroyd, R.A. (Brookhaven National Lab., Upton, NY). *J. Phys. Chem.;* 84: No. 10, 1150-1154(15 May 1980).

Aromatic anions absorb in the visible region of the spectrum and energetic considerations suggest that in solution photodetachment may be an important process at these wavelengths. This study reports electron photodetachment cross sections for $C_6F_6^-$ for wavelengths between 415 and 700 nm. The anion is generated by electron attachment to solute C_6F_6 during an x-ray pulse. Detachment is observed as a change in conductivity induced by a subsequent light pulse from a tunable dye laser. The threshold values are reported for tetramethylsilane, n-butane, cyclopentane, n-pentane, 2,2,4-trimethylpentane, 2,2-dimethylbutane, and neopentane. The thresholds are consistent with an electron affinity of 1.09 +- 0.04 eV for the C_6F_6 molecule. Comparison of the data to the absorption spectrum of $C_6F_6^-$ shows that for photon energies above threshold the major process is photodetachment. The relationship of photodetachment data to other properties of the excess electrons in these solvents is discussed.

32664 Synthetic applications of photosubstitution reactions of poly(pyridyl) complexes of ruthenium (II). Durham, B.; Walsh, J.L.; Carter, C.L.; Meyer, T.J. (Univ. of North Carolina, Chapel Hill). Contract ER-78-S-05-6034. *Inorg. Chem.;* 19: No. 4, 860-865(Apr 1980).

Two new methods for the photochemical synthesis of complexes of the type $Ru(bpy)_2LX^+$ and $Ru(bpy)_2X_2$ (L = pyridine, CH_3CN, etc.; X = ClO_4, NO_3, NCS, Br, etc.) have been developed. The photochemistry is based on photosubstitution reactions of the parent complexes $Ru(bpy)_2L_2^{2+}$ most notably where L is pyridine in solvents of low polarity like dichloromethane. The photochemical methods are versatile and give products in good yield and purity. Mechanistically, the reactions appear to involve a dissociative step at the metal; a quantum yield of 0.18 is found for monosubstitution in $Ru(bpy)_2(py)_2^{2+}$, which is independent of the chemical identity and concentration of the entering ligand, X^-. Some deductions about the photochemical behavior of the related complex $Ru(bpy)_3^{2+}$ based on our observations with $Ru(bpy)_2L_2^{2+}$ are also presented, and the possibility of a special medium effect in low-polarity solvents like dichloromethane is discussed.

RADIATION CHEMISTRY

REFER ALSO TO CITATION(S) 32663

32665 (DOE/ER/01116—33) **Kinetics of growth and decay of excited rare gas atoms and molecules in the pulse radiolysis of pure rare gases and of mixtures of rare gases with molecular quenching agents. Technical progress report.** Firestone, R.F. (Ohio State Univ. Research Foundation, Columbus (USA)). 15 Aug 1980. Contract AS02-76ER01116. 21p. NTIS, PC A02/MF A01.

Section I reports a study of effects of H_2, O_2 and N_2 on the decay rates of all of the Ar(1s) species in argon in the 10^2 to 10^3 torr region. The excited atoms were formed by a pulsed relativistic electron beam. Quenching was found to occur via a direct bimolecular interaction and by means of a two step sequence in which the first step is two-body formation of a dissociative vibrationally excited excimer molecular and the second step is vibrational relaxation of this species by the molecular quenching agent. The decreasing order of bimolecular quenching efficiency is O_2, H_2, N_2 for all Ar(1s) species and that of decreasing potential energy among the Ar(1s) species for each of the quenching agents. Section II is an analysis of effects of N_2 on the temporal behavior and the yield of $Ar_2(^3\Sigma^+/sub\ u/)$ in Ar/N_2 mixtures at high argon pressure. The most likely precursors of the first triplet excimer are $Ar(^3P_2)$ and Ar_2 van der Waals molecules via a near resonant interaction of the latter with $N_2(C^3\ PI/sub\ u/)$. Section III is a discussion of the immoderate and

troublesome sensitivity of the decay rates of excited neon species to impurities and a report on the occurrence of a pronounced dependence of the decay constants of these species on the electron beam pulse number in initially pure neon. Extrapolation of measured values of the $Ne_2(^3\Sigma^+/sub\ u/)$ decay constant to the first pulse provides reproducible values of the radiative decay constant which are 32% smaller than reported previously.

32666 Moment theory analysis of e/sub ROH/$^-$ optical absorption spectra. Carmichael, I. (Univ. of Notre Dame, IN). *J. Phys. Chem.;* **84**: No. 10, 1076-1082(15 May 1980).

A moment theory analysis of the observed optical response of excess electrons in hydroxylic solvents is performed. Several properties of these species are deduced and the approximations inherent in deriving them by this approach are detailed. The values obtained are critically compared with results from the accurate solution of a range of model potentials previously suggested to describe the interaction of the excess particle with the host medium. Some comment is made on the observation of angular momentum in the electronically excited state in irradiated alkaline ice.

32667 Current problems in the localization and solvation of excess electrons in glasses. Kevan, L. (Wayne State Univ., Detroit, MI). Contract EY-76-S-02-2086. *J. Phys. Chem.;* **84**: No. 10, 1232-1240(15 May 1980).

Recent advances and limitations on knowledge of electron localization and solvation are highlighted. The kinetics and mechanism of electron localization remain unknown. The physical interpretation of localization time is clarified. The minimum potential well depth for electron localization appears to be ~ 0.4 eV. A possible explanation of why electron solvation appears to ignore hydrogen bonding in liquids is advanced in terms of preferential selection of lower energy molecular reorientation pathways by analogy to recent results in glasses. New experiments on the molecular details of electron solvation in mixed methyltetrahydrofuran (MTHF)-methanol matrices are reported which argue against a tunneling mechanism from an MTHF environment to a methanol cluster and which support solvation shell conversion by a stepwise mechanism. Results on the electronic structure of presolvated electrons in various polar matrices imply that bound-continuum transitions generally predominate. The implications of this for the trapping potential are discussed. A rationale is given for the different energy level structure that is obtained when two OH dipoles occur in one solvent molecule. Current information on the geometrical structure of solvated electrons is surveyed, and new models of the solvated electron geometry in methanol, MTHF, and 3-methylpentane glasses are presented.

32668 Theory of electron transfer reactions of solvated electrons. Kestner, N.R. (Louisiana State Univ., Baton Rouge). Contract EG-77-S-05-5399. *J. Phys. Chem.;* **84**: No. 10, 1270-1275(15 May 1980).

Electron transfer reactions are reviewed with special reference to solvated electron reactions. Some new results are presented on free energy relations and the most serious problems with the application of the theory are presented.

RADIOCHEMISTRY AND NUCLEAR CHEMISTRY

REFER ALSO TO CITATION(S) 32983

PROPERTIES OF RADIOACTIVE MATERIALS

REFER ALSO TO CITATION(S) 31674, 32633, 32676, 32866

32669 Techniques of preparation and crystal chemistry of transuranic chalcogenides and pnictides. Damien, D.A.; Haire, R.G. (Oak Ridge National Lab., TN (USA)); Peterson, J.R. (Tennessee Univ., Knoxville (USA). Dept. of Chemistry). *J. Phys. (Paris), Colloq.;* No. 4, C4.95-C4.100(1979).

From 3. International conference on electronic structure of the actinides; Grenoble, France (30 Aug - 1 Sep 1978).

The crystal chemistry of a number of transuranic chalcogenides and pnictides has been investigated using ^{243}Am, ^{248}Cm, ^{249}Bk and ^{249}Cf. These compounds were prepared from the corresponding metals by direct reaction with the chalcogen or pnictogen element at elevated temperatures. Higher chalcogenides were thermally dissociated to yield ones of lower stoichiometry, terminating with the sesquichalcogenides; only monopnictides of these transplutonium elements were found. All products were examined by X-ray powder diffraction. In this paper the methods for preparing the actinide chalcogenides and pnictides on a gram scale are reviewed, and the microtechniques used for submilligram quantities of the transamericium elements are presented. The results obtained during this study are compared to data previously reported for the lighter actinide compounds, and the trends observed across the series are discussed.

32670 (RHO-SA—187) Decontamination of the 233-S Building Loadout Hood. Shoemaker, D.C.; Graves, A.W. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). 1980. Contract AC06-77RL01030. 26p. (CONF-800753—1). NTIS, PC A03/MF A01.

From US DOE transuranic waste management program decontamination technology transfer meeting; Richalnd, WA, USA (29 Jul 1980).

This paper summarizes the engineering and field work conducted to decontaminate the 233-S Building Loadout Hood, a plutonium nitrate loadout facility highly contaminated with transuranics. The scope of work supporting the Loadout Hood decontamination effort included a detailed physical and radiological characterization, decontamination/fixation to reduce surface contamination to levels which would allow structural dismantling to be conducted with minimum airborne contamination, and dismantling to remove contaminated components. Decontamination operations were performed in a deliberate, systematic manner to generate data for evaluating the technology and methods used. Pre-dismantling decontamination and fixation efforts were designed to clean Loadout Hood internal surfaces in-place to nondetectable surface contamination levels as an alternative to dismantling in a loose contamination environment. Results of this approach as well as the effectiveness of a HEPA filtered vacuum cleaner, and several different decontamination chemicals and fixatives are evaluated. Recommendations based on lessons learned are made for future decontamination and decommissioning operations.

32671 Structure of Di-μ-aquo-bis(dioxobis(nitrato)uranium(VI))-diimidazole, $[UO_2(NO_3)_2(H_2O)]_2 \cdot 2C_3H_4N_2$, a water-bridged dimer of uranyl nitrate. Perry, D.L.; Ruben, H.; Templeton, D.H.; Zalkin, A. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *Inorg. Chem.;* **19**: No. 4, 1067-1069(Apr 1980).

Positional parameters, distances, and angles are reported for crystalline $UO_2(NO_3)_2(H_2O)_2 \cdot 2C_3H_4N_2$. The structure is reported to be a dimer with two formula units related to each other by a center of symmetry. Two $UO_2(NO_3)_2$ units are bridge bonded via the oxygen atoms of two water molecules which are hydrogen bonded to the nonprotonated nitrogen atom of imidazole and to the nitrate oxygen of an adjacent dimer. The nitrate to water bond links the dimer together into an infinite chain. The infrared spectrum of the complex is reported. (BLM)

32672 Lanthanide (III) and actinide (III) chelate kinetics via solvent extraction. Choppin, G.R. (Florida State Univ., Tallahassee); Muscatello, A.C.; D'Olieslager, W. pp 135-140 of Rare earths in modern science and technology (1978). McCarthy, G.J.; Rhyne, J.J. (eds.). New York, NY; Plenum Publishing Corporation (1978).

A method has been developed to study reactions whose half-lives are on the order of seconds to minutes for which fast-reaction relaxation techniques are not suitable and classical techniques are too slow. We have adapted the technique of solvent extraction in a modified version of ligand exchange. A solvent extraction agent absorbed onto a hydrophobic solid support removes radioactive cations from an aqueous phase. The solid support prevents the formation of emulsions which form at the near neutral pH's used. Removal of filtered aliquots provides data on the rate of extraction which is a function of the decomposition rate of the complex, its formation rate, and the extraction rate of the cation. 3 figures.

RADIOISOTOPE PRODUCTION

REFER ALSO TO CITATION(S) 31688

32673 (DP-MS—79-109) Californium-252 encapsulation at the Savannah River Laboratory. Boulogne, A.R. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1980. Contract AC09-76SR00001. 35p. (CONF-800814—8). NTIS, PC A03/MF A01.

From 180. American Chemical Society meeting/2. chemical congress of the North American Continent; Las Vegas, NV, USA (24 Aug 1980).

More than 1 g of the neutron-emitting isotope californium-252 has been encapsulated at SRL for worldwide medical, industrial, and research uses. Bulk sales packages have been prepared for the USDOE sales program since 1971. Doubly-encapsulated sources have been prepared for USDOE's market evaluation program since 1968. Californium-252 sources for loan and sales packages satisfy the criteria for Special Form Radioactive Material. Encapsulation is performed in special neutron-shielded containment facilities at SRL. Development of improved source and shipping package designs and processes is continuing. 17 figures.

32674 Transplutonium elements production program: extraction chromatographic process for plutonium irradiated targets. Bourges, J.; Madic, C.; Koehly, G. (Centre d'Etudes Nucleaires de Fontena-aux-Roses, France). pp 33-50 of Actinide separations. Navratil, J.D.;

Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

The treatment of irradiated plutonium targets by extraction chromatography allowed the purification of the isotopes ^{243}Am and ^{244}Cm on the scale of few tens of grams. This process proved to be extremely simple and flexible, and yielded results which are reproducible in time. The chief advantage of the TBP process over the HDEHP process in high and medium activity conditions lies in the rapid absorption/desorption kinetics of the elements to be purified and in the separation of americium from curium, which largely offsets its lower selectivity for lanthanide elements. it is certainly possible to improve the performance of this process by: a) optimization of the characteristics of the stationary phase, b) improvement in the filling technique and in hydraulic operation of the columns, c) on-line analysis of americium (the key element in actinide/lanthanide separation) in the eluate. The application of extraction chromatography with HD(DiBM)P to the purification of ^{243}Am of the end of treatment makes the process more consistent, eliminates the delicate stages implemented in hot cell, and considerably improves final product quality.

32675 Americium-curium separation by means of selective extraction of hexavalent americium using a centrifugal contactor. Musikas, C.; Germain, M.; Bathellier, A. (Centre d'Etudes Nucleaires de Fontenay aux Roses, France). pp 157-173 of Actinide separations. Navratil, J.D.; Schulz, W.W. (eds.). Washington, DC; American Chemical Society (1980).

From 177. national meeting of the American Chemical Society; Honolulu, HI, USA (1 Apr 1979).

This paper deals with Am (VI)-Cm (III) separation in nitrate media. The kinetics of oxidation of Am (III) by sodium persulfate in presence of Ag^+ ions were investigated. Organophosphorus solvents were selected. A centrifugal contactor (EC 8-1) was used. (DLC)

32676 Cyclotron isotopes and radiopharmaceuticals. Pt. 31. Improvements in ^{77}Br production and radiochemical separation from enriched ^{78}Se. Madhusudhan, C.P.; Treves, S. (Harvard Medical School, Boston, MA (USA)); Wolf, A.P.; Lambrecht, R.M. (Brookhaven National Lab., Upton, NY (USA)). *J. Radioanal. Chem.;* **53**: No. 1-2, 299-305(1979).

An improved method for production of >100 mCi of ^{77}Br with the ^{78}Se(p, 2n)^{77}Br nuclear reaction and a 4π water-cooled target containing encapsulated metallic ^{78}Se or a Pb^{78}Se alloy has been developed. The ^{77}Br was separated with approximately 98% radiochemical yield and a radionuclidic purity of 98.9%. The time required to isolate carrier-free ^{77}Br free of metallic impurities was less than 4hrs. Isotopically enriched ^{78}Se was quantitatively recovered.

COMBUSTION, PYROLYSIS, AND HIGH-TEMPERATURE CHEMISTRY

REFER ALSO TO CITATION(S) 32649

32677 (DOE/ER/10505—1) **Identification and temporal behavior of radical intermediates formed during the combustion and pyrolysis of gaseous fuels: kinetic pathways to soot formation. Progress report, September 1, 1979-August 31, 1980.** Kern, R.D.; Niki, T.; Clinton, L.M.; Winkeler, P. (New Orleans Univ., LA (USA). Dept. of Chemistry). Apr 1980. Contract AS05-79ER10505. 11p. (CONF-800814—6). NTIS, PC A02/MF A01.

From 180. American Chemical Society meeting/2. chemical congress of the North American Continent; Las Vegas, NV, USA (24 Aug 1980).

A shock tube coupled to a time-of-flight mass spectrometer has been employed to sample mixtures of various fuels (methane, acetylene, propane, cyclohexane, benzene, and toluene) with or without oxygen in order to determine the major kinetic pathways to soot formation. One significant observation has been the product distribution from toluene pyrolysis which consists primarily of compounds and radical intermediates having masses less than that of the parent fuel and containing relatively low amounts of species having masses greater than toluene. The experiment was performed at temperatures and fuel densities where previous laser extinction work reported soot conversion yields of 80 to 90%. Supporting work for our findings is found from Knudsen cell experiments over the temperature range of interest in which the product distribution was recorded mass spectrometrically and from single pulse shock tube experiments which included the analysis of gas after shock heating. These results are important since they question the absolute amounts of soot yield reported by several research groups using the laser extinction technique. However, the relative yields of soot conversion determined by the laser technique from a wide variety of fuels may be correct. Even more important is our result that acetylene is the major product of toluene pyrolysis which argues against the commonly held view that ring condensation steps dominate fragmentation reaction channels.

32678 (DOE/ET/11056—T1) **Complete burning and extinction of a carbon particle in an oxidizing atmosphere. POLY M/AE report No. 80-16.** Matalon, M. (Polytechnic Inst. of New York, Farmingdale (USA). Aerodynamics Labs.). May 1980. Contract AC01-78ET11056. 46p. NTIS, PC A03/MF A01.

The departure from an equilibrium gas phase behavior is described in order to obtain the rate of mass loss M of a pure carbon particle immersed in an oxidizing atmosphere over a wide range of Damkoehler numbers D/sub g/ (representing either the particle size or the ambient pressure). Unlike the equilibrium limit (D/sub g/ $\rightarrow\infty$) in which M depends solely on the indirect oxidation C + CO_2, the present analysis allows a small leakage of oxygen through the flame so that M depends on the direct oxidation C + O_2 as well. Furthermore, the structure of a thin but finite flame where the CO oxidation takes place is analyzed and its influence on M is determined. It leads to a minimum value D/sub g/^{0} (or particle size) below which the CO + O_2 flame cannot persist and the gas phase is necessarily frozen. When the flame exists, it stands at a well defined distance from the particle and in particular it can be adjacent to it; this depends on the particle size and on its surface temperature. Both cases have been analyzed in the present study.

32679 (FE—2018-17) **Fundamentals of nitric oxide formation in fossil fuel combustion. Progress report, March 29-June 28, 1980.** Houser, T.; McCarville, M.E. (Western Michigan Univ., Kalamazoo (USA). Dept. of Chemistry). Jul 1980. Contract AC01-76ET10593. 11p. NTIS, PC A02/MF A01.

During this period two sets of data were obtained: (a) a series of determinations of the rates of NO and/or HCN formation from the oxidation of pyridine at 950°C, and (b) a series of measurements of HCN formation (and a few of NH_3 and NO) from pyridine oxidation at 675 to 775°C to determine its rate of formation and to recheck the previous reactant consumption rate data. At 950°C it was found that under fuel rich conditions no NO and very little NH_3 and N_2 were formed. The only volatile, nitrogen-containing product formed was HCN and its yield was time independent. At fuel lean mixture ratios and low initial concentrations, molecular nitrogen was produced with a little NO as the only other significant nitrogen-containing product. At the higher initial concentrations NO was formed in large yields which were dependent on contact time, first increasing, then decreasing. Since HCN has been the only volatile, intermediate, nitrogen-containing compound formed from the oxidation of pyridine, work was initiated on studying its oxidation characteristics. The first experiments indicate that HCN, in the presence of benzene, oxidizes to NO quite readily at 950°C although when it is the only fuel, very little NO forms. It appears, from the information obtained to date, that HCN is the intermediate through which NO forms from oxidation of heterocyclic nitrogen. If this is the case, there are at least two possible explanations for staged combustion reducing NO formation, (a) a large fraction of the fuel-nitrogen is incorporated in the char and is more difficult to oxidize to NO than is HCN, or (b) an inhibitor forms under fuel rich conditions which blocks the formation of NO from HCN.

32680 (LBL—10784) **Structure of a poly(ethylene) opposed flow diffusion flame.** Pitz, W.J.; Brown, N.J.; Sawyer, R.F. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.; California Univ., Berkeley (USA). Dept. of Mechanical Engineering). Aug 1980. Contract W-7405-ENG-48. 28p. (CONF-800809—5). NTIS, PC A03/MF A01.

From 18. combustion symposium; Waterloo, Canada (17 Aug 1980).

Structural measurements were obtained and compared with other investigations of diffusion flames. Departures from the commonly assumed collapsed flame model of laminar diffusion flames were observed in terms of excessive CO concentrations and oxygen penetration into the fuel side of the flame. An upper bound on the importance of oxygen diffusion to the fuel surface and subsequent surface oxidation was placed at 20% of the energy required for fuel pyrolysis, with the remainder of the energy being delivered to the surface from the flame through heat transfer processes. As the oxygen concentration in the oxidizer flow was decreased and extinction conditions approached, the CO/CO_2 ratio at the flame increased slightly, the oxygen concentration at the luminous flame zone decreased, the flame stand-off distance decreased, and the flame temperature decreased. Radial similarity in the composition and temperature profiles was established experimentally which confirms predictions and greatly simplifies the modeling of the opposed flow diffusion flame.

32681 (UCRL—52931) **TDC: a computer code for calculating chemically reacting hydrodynamic flows in two dimensions.** Haselman, L.C. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 22 May 1980. Contract W-7405-ENG-48. 47p. NTIS, PC A03/MF A01.

The differential and differencing equations used by the Two Dimensional Combustion computer code (TDC) are presented. TDC solves hydrodynamic conservation equations by an explicit method of second-order accuracy. In addition to viscous hydrodynamic equations (both with and without turbulence), equations for chemical species conservation and diffusion, heat conduction, and chemical kinetics are solved. Although the method used is explicit, it is efficient down to Mach numbers of ~ 0.01. Boundary conditions available include rigid, source, sink, constant pressure, and moving rigid boundaries. The code was developed primarily for use in applications related to the internal combustion engine. However, the generality of the methods and boundary conditions make it easily adaptable to many combustion applications. Examples are given of the flow field in an axisymmetric engine, and combustion in a swirling flow.

ENGINEERING

FACILITIES AND EQUIPMENT

REFER ALSO TO CITATION(S) 31720, 31722

32682 (SLAC-PUB—2528) **Materials and lubrication for gear and bearing surfaces in uhv.** Kirby, R.E.; Collet, G.J.; Garwin, E.L. (Stanford Linear Accelerator Center, CA (USA)). Jun 1980. Contract AC03-76SF00515. 4p. (CONF-800928—2). NTIS, PC A02/MF A01.

From 8. international vacuum congress/ 4. international conference on surface science and 3. European conference on solid surface; Cannes, France (22 Sep 1980).

During design and construction of the SLAC polarized LEED (PLEED) system, a search was made for a dependable gear, bearing, and lubrication system for the computer-controlled Faraday cup used to measure diffracted beams. Components must be nonmagnetic, bakeable to 250°C, and at room temperature must operate at pressures in the 10^{-9} to 10^{-10} Pa range. A test system was constructed which incorporated a meshed pair of dissimilar pitch diameter spur gears, one of which was confined to (by bushings) and rotated on a fixed shaft, while the other gear was driven by a commercial rotary motion feedthrough which was rotated by a servo motor driven in sine fashion with a direction reversal every six turns and peak speeds of 50 rpm. The criterion for a successful pair was ~ 10^5 turns, the life rating for the feedthrough. Pairs had actual turn counts from less than 1 to 91,000. Materials for gears included stainless steel, beryllium copper, and aluminum alloys. Lubricants used singly and in concert were MoS_2, WS_2, Ag, hard chrome, and a MoS_2-graphite-sodium silicate mixture. The successful gear pair was Ag-plated Al alloy and MoS_2-graphite-sodium silicate-coated Be-Cu. Subsequent performance in the PLEED system after repeated bakeouts will also be discussed.

32683 (UCRL—82233) **Application of the Reissner principle to the postbuckling of plates exposed to creep.** Vagliente, V.N.; Mayers, J.; Hoff, N.J. (California Univ., Livermore (USA). Lawrence Livermore Lab.; Stanford Univ., CA (USA). Dept. of Aeronautics and Astronautics). 21 May 1979. Contract W-7405-ENG-48. 32p. (CONF-800907—1). NTIS, PC A03/MF A01.

From Aspects of creep conference; Sheffield, UK (Sep 1980).

A systematic procedure is presented which reduces a kinematically and constitutively nonlinear time-dependent plasticity problem, specifically steady state creep buckling of a compressed plate, to a straightforward solution of a set of nonlinear algebraic equations. The procedure uses a modified-Reissner variational principle in conjunction with Hoff's elastic analog to provide the stresses and deformations of the plate. For application in the design process, the approach offers an attractive alternative to those methods in which either the formidable equilibrium, compatibility, and constitutive equations, together with the artifice of the elastic analog, are used to effect approximate solution, or, instead, a variational principle alone is employed wherein the complex states of stress and strain must necessarily be defined in time-dependent terms from inception of the analysis. A comparison of the present solution results for steady state creep buckling of a uniformly end-shortened, initially imperfect simply supported square plate is made with earlier results obtained by Levi and Hoff using the more classical approach in conjunction with the elastic analog. The present work also improves the membrane's stress distribution to achieve closer satisfaction of stress-displacement compatibility; the comparison indicates that the previously obtained results for stresses and lateral displacement underestimate the stiffness of the plate as the creep process progresses. No finite critical time representing the growth of unbounded plate lateral deflection is observed for the loading case of controlled end-shortening (rigid testing machine). Nevertheless, the concept and general procedure presented can be applied in the preliminary design process to establish the useful life under creep conditions of a specific initially imperfect plate-type structural element undergoing time-dependent plastic deformation at constant load.

CRYOGENIC AND SUPERCONDUCTING EQUIPMENT AND DEVICES

REFER ALSO TO CITATION(S) 33107, 33108

32684 (AD-A—076125) **No-load testing of the shaped field super-conductive motor. Final report.** Robey, H.N.; Cannell, M.J.; Dunnington, L.T. (David W. Taylor Research and Development Center, Bethesda, MD (USA)). Oct 1979. 55p. NTIS, PC A04/MF A01.

A laboratory-model superconductive d.c. motor, designed and constructed at the David W. Taylor Naval Ship Research and Development Center for peak power output in the 400 to 1000 hp range, has been undergoing no-load testing since January 1973. Results, reported herein, substantially validate the loss estimates (6.5 kW total power loss at 1800 rpm, 120 amp field current, open circuit) predicted in a prior analysis, and indicate that no major problems should be encountered in future planned load tests, with the possible exception of the collector electromagnetic stability, which cannot be evaluated satisfactorily at no-load conditions. Background information on machine development and discussions of the liquid metal and cryogenic helium handling procedures are also included.

32685 **Microfilamentary superconducting composites by the external diffusion method: Nb_3Sn.** Cogan, S.F.; Holmes, D.S.; Rose, R.M. (Department of Materials Science and Engineering, and Plasma Fusion Center, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139, and Wright Patterson Air Force Base, Ohio 45433.). *J. Appl. Phys.;* **51**: No. 8, 4332-4337(Aug 1980).

Microfilamentary superconducting composites of Nb_3Sn fibers in bronze matrices were produced by the external diffusion method together with a solution preanneal to suppress Kirkendall porosity. The resulting materials had superior superconducting and mechanical properties at 4.2 °K, carrying overall current densities well over 10^4 A/cm² at 15.4 T even for low (12%) superconductor fractions; over 10^5 A/cm² at 12 T; and tolerating (in some cases) strains of the order of 2% without degradation, and stresses in the 500—1000 MPa range. There is evidence that finer superconducting filaments can tolerate much greater intrinsic strains without degradation; also, that the composites investigated were not optimized in terms of residual stresses, matrix composition, or filament spacing or size, so that further improvements are possible.

PROTECTIVE STRUCTURES AND EQUIPMENT

32686 (UCRL—84036) **Effectiveness of self-contained breathing apparatus in a fire environment.** Held, B.J.; Harder, C.A. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 18 Jul 1980. Contract W-7405-ENG-48. 36p. (CONF-800934—1). NTIS, PC A03/MF A01.

From International environment and safety conference; London, UK (1 Sep 1980).

Several tests that are described to help determine the effectiveness of self-contained breathing apparatus operating under some of the stresses imposed on it at a fire scene. It is recommended that tests be devised to measure effects of fire decomposition products and chemicals, either through gradual corrosion or by immediate SCBA failure. Mechanical stress tests are also needed, because fire fighter SCBA are subjected to vibration stress from apparatus moving over rough roads and rough handling at the scene of a fire or emergency. Radiant heat tests are also needed.

HANDLING EQUIPMENT AND PROCEDURES

REFER ALSO TO CITATION(S) 32670

SHIPPING CONTAINERS

REFER ALSO TO CITATION(S) 32292

32687 (SAND—80-8021) **Safety analysis report for packaging a DOT 7A specification container for tritiated liquid wastes.** Alford, E. (Sandia National Labs., Livermore, CA (USA)). Aug 1980. Contract AC04-76DP00789. 24p. NTIS, PC A02/MF A01.

This Safety Analysis Report for Packaging (SARP) was prepared in accordance with ERDA (DOE) Appendix 5201 for DOE/ALO review and approval of packaging of tritiated liquid wastes to be shipped from Sandia National Laboratories, Livermore, (SNLL) California. This report presents information pertinent to the construction of tritiated liquid waste shipping containers. It contains design and development considerations, explains tests and evaluations required to prove the container can withstand normal transpor-

tation conditions, and demonstrates that the Sandia container-and-radioactive-material shipment package is in compliance with DOE and Department of Transportation (DOT) safety requirements. An internal review of this SARP has been performed in compliance with the ERDA (DOE) Manual, 5201 Appendix V.

MINING AND DRILLING EQUIPMENT AND FACILITIES

32688 Underwater inspection/testing/monitoring of offshore structures. Busby, R.F. (R. Frank Busby Assoc., Arlington, VI). *Ocean Eng.;* 6: No. 4, 355-491(1979).

The extraction of offshore oil and gas deposits has resulted in installation of massive steel and concrete platforms in progressively deeper and more hostile waters. Concern for the safety of platform personnel, potential damage to the environment, and the assurance of profitable, unimpeded, extraction of these offshore resources is a concern of host-country governments and the offshore operators. Requirements for underwater inspection of these structures and the techniques and tools to conduct such inspection vary widely from country-to-country. In some instances periodic inspection is required by law; in other instances there is no requirement whatever once the structure has been installed. The instruments to conduct underwater inspections also vary; their effectiveness is sometimes questionalbe, and the cost of underwater inspection to the operator (which will eventually be borne by the consumer) is high and will get higher as the water depth and complexity of the structure increases. The purpose of this six month study was: 1) to identify and describe all actual or potential underwater inspection requirements for fixed concrete and steel structures promulgated by the governments of offshore oil and gas producing countries and by the offshore operators themselves; 2) to identify and assess the state-of-the-art in underwater non-destructive testing/monitoring/inspection of offshore structures; 3) to evaluate the capability of servicing and hardware producers to meet the inspection requirements identified; and 4) to describe and establish priorities for specific tasks for technology development that should be undertaken to satisfy current and future requirements. 10 tables.

LASERS

REFER ALSO TO CITATION(S) 32263, 32834

32689 (AD-A—075784) **Bibliography of soviet laser developments, number 38, November—December 1978.** (Defense Intelligence Agency, Washington, DC (USA)). Sep 1979. 119p. NTIS, PC A06/MF A01.

Coverage includes basic research on solid state, liquid, gas, and chemical lasers; components; nonlinear optics; spectroscopy of laser materials; ultrashort pulse generation; theoretical aspects of advanced lasers; and general laser theory. Laser applications are listed under biological effects; communications; beam propagation; computer technology; holography; laser-induced chemical reactions; measurement of laser parameters; laser measurement applications; laser-excited optical effects; beam-target interaction; and plasma generation and diagnostics.

32690 (AD-A—076010) **Performance and diagnostics of lasers initiated by the reaction of NO with ClO_2.** Arnold, S.J.; Foster, K.D.; Snelling, D.R. (Defence Research Establishment Valcartier, Courcelette, Quebec (Canada)). Sep 1979. 25p. NTIS, PC A02/MF A01.

A purely chemical HCl laser employing transverse flow was operated with a maximum multiline output power of 13 W, which represents a chemical efficiency of 8.6% based on the total exothermicity of the pumping reaction. The required nonequilibrium concentration on Cl atoms was generated by the branched-chain reaction of NO with ClO_2. Mass spectrometric and absorption spectroscopic measurements of species concentrations in the NO/ClO_2 reaction system showed that the effectiveness of production of the branched chain decreased with increasing total pressure.

32691 (AD-A—076124) **Flameout and acoustic damping in pulsed chemical lasers. Final technical report.** Limpaecher, R. (Avco-Everett Research Lab., Everett, MA (USA)). Jun 1979. Contract N00173-76-C-0162,. 149p. NTIS, PC A07/MF A01.

The objective of this program was to address the acoustic damping issue of a repetitively-pulsed atmospheric pressure pulsed chemical laser. For this purpose a device, one meter in size parallel to the optical axis, was designed and constructed. To achieve flameout 80 fluidic devices were used to control the hydrogen flow. A new mixer was fabricated to obtain the required medium quality using a photochemical machining technique. For the acoustic quieting a heat exchanger was used to reduce the acoustic reflection of the hot-cold gas interfaces, and a muffler type acoustic absorber was constructed for acoustic energy attenuation. The results of a limited test period have been described.

32692 (LA-UR—80-2015) **Free electron lasers.** Brau, C.A. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 31p. (CONF-800555—2). NTIS, PC A03/MF A01.

From International conference on lasers; Shanghai, China (3 May 1980).

A review of experimental and theoretical concepts of a free electron laser is given. The possibilities of scaling these lasers to high powers are discussed. (MOW)

32693 (UCRL—84763) **Metal Organic-Chemical Vapor Deposition fabrication of semiconductor lasers.** Thomas, C. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). 6 Aug 1980. Contract W-7405-ENG-48. 11p. (CONF-800836—1). NTIS, PC A02/MF A01.

From 52. NTA annual convention; Chicago, IL, USA (12 Aug 1980).

The Metal Organic-Chemical Vapor Deposition (MO-CVD) process will be studied and implemented in detail. Single crystal GaAs, and Ga/sub x/Al/sub 1-x/As films will be grown on GaAs by depositing metal-organic alkyl-gallium compounds in the presence of an arsine mixture. The metal-organic chemical vapor deposition process will allow formation of the semiconductor compound directly on the heated substrate in only one hot temperature zone. With MO-CVD, semiconductor films can be efficiently produced by a new more economical, less complicated process which will lend itself more easily than past fabrication procedures, to high quantity, high quality reproduction techniques of semiconductor lasers. Clearly MO-CVD will be of great interest to the communication industry where semiconductor lasers will be used extensively in fiber optic communication systems, and similarly to the solar energy business where GaAs substrates are used as photoelectric cells.

32694 Locking of cw dye laser emission onto the wavelength of molecular fluorescence by intracavity gain: Example I_2. Truesdell, K.A.; Keller, R.A.; Zalewski, E.F. (Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico 87545). *J. Chem. Phys.;* 73: No. 3, 1117-1126(1 Aug 1980).

A cw dye laser can be locked onto wavelengths corresponding to iodine (I_2) fluorescence when the fluorescing samples are placed inside the dye laser cavity. The sensitivity of the dye laser to intracavity gains is analogous to its well-known sensitivity to intracavity losses. Gains as low as 0.0001 were detected. In particular, the 5145 A emission of an Ar^+ laser was used to excite I_2 molecules inside of a tunable dye laser cavity to the $v'=43$, $J'=12$ and/or 16 level (s) of the B $^3\Pi u$-italic$^+$ ground electronic state. The dye laser was then progressively tuned to stimulate emission to the $v''=10$—15,$J''=11$, 13 and or 15, 17 levels of the $X^1\ \Sigma g$-italic$^+$ ground electronic state. The efficiency of the dye laser assisted I_2 laser was 1—2 orders of magnitude higher than for the Ar^+ pumped cw I_2 laser. The locking of the dye laser to the I_2 fluorescence frequencies was found to be a function of the specific vibrational and rotational quantum numbers. When the dye laser is operated above threshold, spatial hole burning severely limits the fraction of the laser power locked onto I_2 fluorescence wavelengths.

32695 Parasitic oscillations in the static centered two-aperture limit. Elliott, C.J. (University of California, Los Alamos Scientific Laboratory, Group X-1, P.O. Box 1663, Los Alamos, New Mexico 87545). *Appl. Opt.;* 19: No. 13, 2109-2117(1 Jul 1980).

A class of stray-light parasitic oscillation problems observed in high-gain laser systems is attacked by the integral equation method of Selden. The feedback fraction product determined by this method is compared with a simple estimate based on the solid angles of the apertures and is found to differ by a factor lying between $(2/\pi)^4$ and unity. This factor is computed numerically for all two-rectangular-aperture problems and analytically in special cases. We thus determine the static parasitic oscillation threshold for all these problems and deduce the corrections needed for the simple solid-angle method of computation.

32696 Megawatt dye laser oscillator-amplifier system for high resolution spectroscopy. Drell, P.; Chu, S. (Univ. of California, Berkeley). *Opt. Commun.;* 28: No. 3, 343-348(Mar 1979).

Peak powers in excess of 4 MW in the visible and 1.3 MW in the uv with linewidths as narrow as 80 MHz are generated with three YAG pumped amplifier stages following a cw dye oscillator. The laser pulses are nearly Fourier transform limited in frequency space and diffraction limited in coordinate space.

HEAT TRANSFER AND FLUID FLOW

32697 Slope and intercept of the dimensionless velocity profile for artificially roughened surfaces. Hodge, S.A. (Texas Univ., Austin (USA)); Sanders, J.P. (Oak Ridge National Lab., TN (USA)); Klein, D.E. (Texas Univ., Austin (USA). Nuclear Reactor Lab.). *Int. J. Heat Mass Transfer;* 23: No. 2, 135-140(Feb 1980).

A method is demonstrated for determination of the slope and intercept of the universal velocity distribution law for flow past roughened surfaces without the need for measurement of the velocity profile. The slope is shown to vary with the nature of the roughened surface and in some cases to deviate considerably from that for turbulent flow past smooth walls. It is further shown that the intercept, commonly known as the roughness parameter $R(h^+)$, is independent of the width of the velocity profile. The dependence noted by previous investigators was due to an assumption that the slope of the law of the wall for roughened surfaces is constant and equal to that for smooth surfaces.

32698 (ORNL-MIT—213) **Cocurrent three-phase fluidized bed. Part 2.** Burck, G.M.; Kodama, K.; Markeloff, R.G.; Wilson, S.R. (Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice). 19 May 1975. Contract W-7405-ENG-26. 66p. NTIS, PC A04/MF A01.

Operating characteristics and gas-liquid mass transfer have been examined in a cocurrent three-phase fluidized bed using an air-carbon dioxide gas mixture, water, and three packings. Minimum fluidization velocities were determined, but correlation of the volume fraction of each phase with packing characteristics was only successful for the solids due to scatter in the data. Several improvements are suggested. The concentration profile for 4 x 8 mesh alumina beads approximated a plug flow model, and the K/sub L/a was about twice that for 0.25-in. Plexiglas spheres whose profile approached a CSTR model. The K/sub L/a and the degree of dispersion for a bubble column at similar flow conditions were between values found for the columns containing alumina and Plexiglas packings.

MATERIALS TESTING

REFER ALSO TO CITATION(S) 32547

32699 (LA-UR—80-1277) **Applications of industrial computed tomography at Los Alamos Scientific Laboratory.** Kruger, R.P.; Morris, R.A.; Wecksung, G.W. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 9p. (CONF-800911—1). NTIS, PC A02/MF A01.

From 1. European signal processing conference; Lausanne, Switzerland (16 Sep 1980).

A research and development program was begun three years ago at the Los Alamos Scientific Laboratory (LASL) to study nonmedical applications of computed tomography. This program had several goals. The first goal was to develop the necessary reconstruction algorithms to accurately reconstruct cross sections of nonmedical industrial objects. The second goal was to be able to perform extensive tomographic simulations to determine the efficacy of tomographic reconstruction with a variety of hardware configurations. The final goal was to construct an inexpensive industrial prototype scanner with a high degree of design flexibility. The implementation of these program goals is described.

32700 (SAND—79-0050) **Glossary of terms commonly used in the digital analysis of dynamic data.** Smallwood, D.O. (ed.). (Sandia National Labs., Albuquerque, NM (USA)). Jul 1980. Contract AC04-76DP00789. 46p. NTIS, PC A03/MF A01.

A list of words has been compiled that explain dynamic data generated when measuring in-series conditions of mechanical and electrical data.

SAFETY ENGINEERING

REFER ALSO TO CITATION(S) 32706

ELECTRONIC CIRCUITS AND DEVICES

REFER ALSO TO CITATION(S) 32899

32701 (GEPP-OP—473) **Determining the mode of high voltage breakdowns in vacuum devices.** Miller, H.C.; Furno, E.J.; Sturtz, J.P. (General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.; General Electric Co., San Jose, CA (USA)). 1980. Contract AC04-76DP00656. 19p. (CONF-800923—1). NTIS, PC A02/MF A01.

From 9. international symposium on discharges and electrical insulations in vacuum; Eindhoven, Netherlands (16 Sep 1980).

High voltage breakdowns (HVBs) occur in many vacuum devices. It frequently is of great practical interest to know the type (or mode) of such HVB's, since this can indicate weak points in the device. Post-mortems can sometimes be helpful, but it would be quite desirable to have a technique which would allow the HVB mode to be determined in an operating device. Photography can be quite helpful, but unfortunately many devices do not permit optical access to the region of interest. However, the idea of using photography in conjunction with other diagnostic techniques to establish the validity of these techniques seemed promising, since these techniques could then be used to determine the mode of HVBs in opaque devices. A literature search indicates that promising techniques are to measure the voltage applied to the device (or the current through the device) and also to look for x-rays generated by the device during an HVB.

32702 (GEPP-OP—476) **Improving the voltage holdoff performance of alumina insulators in vacuum by quasimetallizing or doping.** Miller, H.C. (General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.). 1980. Contract AC04-76DP00656. 19p. (CONF-800903—2). NTIS, PC A02/MF A01.

From 6. international conference on high voltage microscopy; Antwerp, Belgium (1 Sep 1980).

The high voltage holdoff capability of insulators may be improved by changing the material of the insulator or by a proper choice of geometry for the device using the insulator. Results applicable to insulators in various ultrahigh vacuum devices were desired, so work on modifying an alumina ceramic insulator material was selected. It was found that treatment of the surface of an alumina insulator with coatings incorporating varying amounts of Cr, Mn, and Ti can significantly increase the vacuum voltage holdoff capability of the insulator (up to 25%). During processing (quasimetallizing) the coating penetrates into the alumina, so it is insensitive to mechanical damage. This quasimetallize treatment is also compatible with subsequent metallizing and brazing of the alumina insulator. A 7 Mn:1 Ti coating mix performed very well, being found to be as effective on a 94% Al_2O_3 alumina as on the previously investigated 95% Al_2O_3, 1% Cr_2O_3 alumina. Mixes of 6 Mn:1 Ti:1 Cr and 6 Mn:3 Cr performed about as well as the 7 Mn:1 Ti mix, but no better.

32703 (GEPP-TIS—476) **Improving the voltage holdoff performance of alumina insulators in vacuum by quasimetallizing or doping.** Miller, H.C. (General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.). 11 Aug 1980. Contract AC04-76DP00656. 15p. NTIS, PC A02/MF A01.

Treatment of the surface of an alumina insulator with coatings incorporating varying amounts of Cr, Mn, and Ti can significantly increase the vacuum voltage holdoff capability of the insulator (up to 25 percent). During processing (quasimetallizing) the coating penetrates into the alumina, so it is insensitive to mechanical damage. This quasimetallize treatment is also compatible with subsequent metallizing and brazing of the alumina insulator. Quasimetallizing with appropriate formulations has been shown to change the surface characteristics of alumina in two ways: it decreases both the surface resistivity of the alumina and the secondary electron emission yield of the alumina. Each change improves the voltage holdoff characteristics of the alumina. Similar improvements in voltage holdoff capability can be obtained by doping the plain alumina to the 5 percent (by weight) level with additives of 4 parts Mn/1 part Ti or 2 Mn/1 Ti/1 Cr. Such doped ceramics have the advantage of requiring fewer processing steps than do the quasimetallized ceramics. Both doped and quasimetallized ceramics are suitable for use in ultrahigh vacuum apparatus.

32704 (GEPP-TIS—511) **Crack analysis, glass-ceramic insulator of vacuum tube.** Spears, R.K. (General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.). 25 Aug 1980. Contract AC04-76DP00656. 23p. NTIS, PC A02/MF A01.

The high voltage glass-ceramic insulators from ten vacuum tubes that had failed a bubble leak test were analyzed to determine the cause. All insulators exhibited a similar crack pattern. It appeared that the primary crack initiated at a point near the top of the insulator and resulted in a fracture that radiated from the inner sleeve of the tube to the outer frame. These cracks were duplicated on subassemblies by applying heat to the inner sleeve near the top surface of the insulator. It was determined that the cracks resulted from heating problems associated with the source closure braze. It was determined that misalignment of the radio-frequency braze coil caused cracking of assemblies.

32705 (UCRL—84640) **DASLL: an automatic printed circuit board layout system.** Magnuson, W.G. Jr. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). 1980. Contract W-7405-ENG-48. 8p. (CONF-801005—2). NTIS, PC A02/MF A01.

From International conference on circuits and computers; Port Chester, NY, USA (1 Oct 1980).

DASLL stands for Design Automation System at Lawrence Livermore and is a system of computer programs to automatically lay out printed circuit boards. The focus has been on two-sided PCB fabrication aids; primarily drill tape, documentation, and artwork generation (including etch, silkscreen, and drill schedule artwork). Limited four-layer PCBs are also possible with the program. DASLL can be used in either batch-interactive or batch made of operation by technicians, draftsmen, designers, or engineers. Flexibility in being able to accomodate a diversity of trimline geometries

and component shapes and placements was a goal in the design of the software. The system is also very flexible in its capability to deal with physical design rules. A principal objective for the system has been low-volume, quick turnaround response for low and medium density custom printed circuit boards.

WASTE PROCESSING PLANTS AND EQUIPMENT

REFER ALSO TO CITATION(S) 31527, 32504, 32505

32706 Approach to energy attenuation of explosive wasted in processing equipment. Nollet, A.R.; Sherwin, E.T.; Madora, A.W. New Castle, DE; AENCO, Inc. (1978). 11p. (CONF-7805135—2). AENCO, Inc., 1502 Reybold Ave., New Castle, DE.

From 6. mineral waste utilization symposium; Chicago, IL, USA (2 May 1978).

A National Survey indicates Solid Waste Processors for Resource Recovery are experiencing an average of one explosion per 85,000 tons shredded - one large operator has had 30 explosions in the shredding of 800,000 tons. The design and operating experience of a Micro-Fog Explosion Suppression System is discussed. Criteria and method of system design are presented. The need for more research and operating experience is emphasized.

COMBUSTION SYSTEMS

REFER ALSO TO CITATION(S) 31470, 31548, 32190, 32492, 32493, 32681

32707 (CONF-790432—(Vol.1), pp 495-502) **Energy economizer for low temperature stack gas: a case study.** Tipton, J.A. (Dept. of Energy, Bartlesville, OK). 1979.

From Conference on industrial energy conservation technology and exhibition; Houston, TX, USA (22 Apr 1979).

Bartlesville (Oklahoma) Energy Technology Center (BETC) engineers made a study of recycling waste heat from one of the power plant boilers. The study showed that a system could be designed that would reclaim this waste heat and then utilize it to preheat air for boiler operation. The system incorporated a heat-pipe heat exchanger flanged in a stack by-pass loop that would efficiently capture and transfer heat at low temperature differences (350 to 500°F). After reclaiming heat from this source, the burner air supply is preheated by passing through the heat exchanger. Sensitive design problems that had to be resolved were: overall cost-effectiveness; below-dewpoint cooling of stack gas causing acid corrosion; and selection of an effective heat exchanger. The candidate boiler is one of two that generate high-temperature hot water (HTHW) for BETC facility heating and cooling. One unit normally handles the heating and cooling load, while the other is in standby status. The preheat system was designed by BETC engineers. The new stack assembly was fabricated by a local metal shop, and was installed by BETC maintenance personnel. The cost of the heat exchanger and other hardware was $7562. Operational results show that boiler efficiency has increased between 6 and 7%, which reflects the percent of reduction in fuel consumption. At full-load conditions, the burner supply air is preheated to 350°F and stack gas is cooled to 310°F. Corrosion damage to the heat exchanger and other internal parts are nonexistent. Natural gas is the boiler fuel, and, as expected, no residue coating of the heat exchanger has developed.

32708 (DOE/MC/14143—t1) **Measurements of microwave transmission characteristics through various configurations of fluidized bed materials.** (BDM Corp., McLean, VA (USA)). May 1980. Contract AC21-80MC14143. 27p. NTIS, PC A03/MF A01.

The feasibility of developing a microwave diagnostic system for measurement of bubbles in a fluidized bed combustion system has been experimentally investigated. Experiments were performed in a simple waveguide geometry, using microwave frequencies from 2.4 to 3.9 GHz. Styrofoam spacers were used to simulate bubbles in bed materials, such as Greer limestone. The results show that it is feasible to develop a diagnostic system based on microwave transmission through a system consisting of gaps in a limestone media, such as a fluidized bed. The gap has been shown to perturb the transmitted power, and to be very sensitive to bubble and bed material dimensions. Resonance effects are shown to occur when dimensions are integer multiples of a quarter wavelength.

32709 (DOE/METC/SP—80/15) **Development of a simple fluidized-bed coal combustion model for the assessment of a pressurized fluidized-bed combustion system for electrical power generation.** Saxena, S.C.; Turek, D.G. (Department of Energy, Morgantown, WV (USA). Morgantown Energy Technology Center). Jul 1980. 141p. NTIS, PC A07/MF A01.

This report summarizes the state-of-the-art in the mathematical modeling of fluidized-bed coal combustors with the goal of evolving a general framework which will be appropriate for developing a system model for the fluidized-bed coal combustion and power generation technology. Consequently, no attempt is made to generate a functional model, but instead a very simple model is proposed as a first step. The model considers all the essential ingredients of coal combustion and sulfur absorption in fluidized-bed reactors. These are coal devolatilization, char combustion in a bed of dolomite or calcium carbonate, sulfur retention in the fluidized-bed elutriation from the bed, and heat removal by cooling tubes imbedded in the bed. The model is presented and a numerical scheme is proposed which will permit the calculation of bed temperature, coal combustion efficiency, sulfur retention, flue gas composition, and overflow from the bed. Numerical results are presented in which the dependence of the various combustion and operating parameters is examined.

MARINE ENGINEERING

32710 Marine riser measuring joint. van den Bussche, H.K.J.; van Soldt, N.J.; van de Krogt, A.H.; Drinkwaard, W. (to Shell Oil Co.). US Patent 4,174,628. 29 Nov 1979. Filed date 10 Jul 1978. 8p.

A marine pipe riser, through which wells may be drilled during offshore drilling operations, is provided with an instrumented section equipped with stress-measuring elements so that loads and stress on the pipe riser may be measured. (7 figures)

32711 (SAND—80-0317C) **Optimized design and predicted performance of a deep ocean 50 m piston coring system.** Karnes, C.H.; Burchett, S.N.; Dzwilewski, P.T. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 9p. (CONF-800921—2). NTIS, PC A02/MF A01.

From IEEE/Oceans '80 conference; Seattle, WA, USA (8 Sep 1980).

Calculational techniques are described which were developed or adapted for the purpose of analyzing the mechanical response of a proposed piston coring system capable of recovering high quality 50 m long cores. The analysis includes the effects of barrel geometry on the mass required to penetrate 50 m of an assumed sediment, the effects of non-vertical entry and pullout on the stresses within the barrel, and the effects of steel cable or parachute piston restraints on the resulting core sample distortion. The results show that a wall thickness of 50 mm in the upper section is necessary to survive an entry of up to 1.5° from vertical or a recovery angle of up to 5°. They also show that a mass of 15,400 kg and a pullout force of 330 kN are required. It is shown that active piston control is necessary to eliminate piston motion during penetration.

POLLUTION CONTROL EQUIPMENT

32712 (AD-A—075947) **Control of particulate emissions from turbine engine test cells by cooling water injection. Final report Feb—May 79.** MacNaughton, M.G.; Tarquinio, J.J.; Martone, J.A. (Air Force Engineering and Services Center, Tyndall AFB, FL (USA)). Jul 1979. 77p. NTIS, PC A05/MF A01.

The operation of DOD turbine engine test cells in California has been criticized by the State environmental regulatory agencies because smoke generated by some engines results in excessive opacity (visibility) of the test cell exhaust plume. Since the plume exceeds visibility standards for only a relatively small proportion of engines tested a low cost control technique which brings the test cell into compliance with opacity standards is required. This study was initiated to verify that, in addition to forming a steam plume, water used to cool the test cell walls also removes engine generated particulates and substantiates this procedure as a legitimate pollution control technique. It can be concluded from this study that water injection as practiced at McClellan AFB test cell results in significant (approx. 50% by weight) control of turbine engine particulate emissions. It is postulated that the process could be made more efficient by the use of better designed spray nozzles which would increase water droplet particle contact and inclusion of a demister to increase water removal from the exhaust.

RANKINE

REFER ALSO TO CITATION(S) 32491

PARTICLE ACCELERATORS

DESIGN, DEVELOPMENT, AND OPERATION

REFER ALSO TO CITATION(S) 32945

32713 (AD-A—076200) **Generation of high energy-high current ion pulses by magnetic compression of ion rings. Interim report.** Kapetanakos, C.A. (Naval Research Lab., Washington, DC (USA)). 24 Oct 1979. 34p. NTIS, PC A03/MF A01.

A scheme is proposed for the generation of intense, high energy ion pulses by magnetic compression of ion rings. After compression the ring is extracted through a half magnetic cusp that transforms an appreciable fraction of the ring's rotational energy to translational energy. Using the Vlasov-Maxwell approach, it has been shown the existence of equilibrium of a hollow, rotating beam in the absence of an external magnetic field and a conducting guide tube. Therefore, the proposed scheme appears to be in particular useful for those applications that require a large separation between the accelerator and the target.

32714 (LA—8407-PR) **Medium-energy physics program. Progress report, August 1-October 31, 1979.** van Dyck, O.B.; Dunn, E.D. (comps.). (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 72p. NTIS, PC A04/MF A01.

This quarterly report covers the last month of LAMPF Cycle 24, with 500-μA H^+ beam current and low-intensity polarized and unpolarized H^- beams. The 800-MeV spin precessor installation is shown, and some activities preparing for dual-energy operation are reported. Six research reports containing significant data are abstracted and indexed individually. 32 figures, 16 tables.

BEAM DYNAMICS, FIELD CALCULATIONS, AND ION OPTICS

REFER ALSO TO CITATION(S) 32713

32715 (BNL—27973) **Survey of beam-beam limitations.** Courant, E.; Cornacchia, M.; Donald, M.M.R.; Evans, L.R.; Tazzari, S.; Wilson, E.J.N. (Brookhaven National Lab., Upton, NY (USA); California Univ., Berkeley (USA). Lawrence Berkeley Lab.; European Organization for Nuclear Research, Geneva (Switzerland); Stanford Linear Accelerator Center, CA (USA)). 1979. Contract AC02-76CH00016. 5p. (CONF-790787—1). NTIS, PC A02/MF A01.

From Workshop on beam current limitations in storage rings; Upton, NY, USA (16 Jul 1979).

The effect of beam-beam interaction is known to limit the luminosity of electron-positron storage rings and will, no doubt, limit the proton-antiproton collision scheme for the SPS. While theorists are struggling to explain this phenomenon it is more instructive to list their failures than their rather limited successes, in the hope that experiments may emerge which will direct their endeavors. The search for a description of a nonlinear system as it approaches the limit in which ordered motion breaks down, is the nub of the problem. It has engaged many fine mathematical intellects for decades and will no doubt continue to do so long after ISABELLE, the p antip and LEP are past achievements. Empirical scaling laws are emerging which relate electron machines to each other but their extrapolation to proton machines remain a very speculative exercise. Experimental data on proton limits is confined to one machine, the ISR, which does not normally suffer the beam-beam effect and where it must be artificially induced or simulated. This machine is also very different in important ways from the p antip collider. The gloomy picture which has emerged recently is that the fixed limits which were conventionally assumed for proton and electron machines can only be said to be valid for the machines which engendered them - the best guess that could be made at the time. They are very difficult to extrapolate to other sets of parameters.

32716 (BNL—28020) **Dispersion correction through movement of the closed orbit.** Parzen, G. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 5p. (CONF-800740—4). NTIS, PC A02/MF A01.

From 11. international conference on high energy accelerators; Geneva, Switzerland (7 Jul 1980).

Portions of document are illegible.

The closed orbit correction system can be used to correct the vertical dispersion by displacing the orbit at the quadrupoles and sextupoles. The accuracy of the results have been verified by comparison with exact calculations. Results for correcting the horizontal dispersion are also given.

32717 (BNL—28034) **Condition for a single bunch high frequency fast blow-up.** Wang, J.M.; Pellegrini, C. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 8p. (CONF-800740—2). NTIS, PC A02/MF A01.

From 11. international conference on high energy accelerators; Geneva, Switzerland (7 Jul 1980).

Portions of document are illegible.

We study the longitudinal stability of a single particle bunch in a storage ring using Vlasov equation. We show that the Vlasov equation has solutions corresponding to a fast, microwave instability if a condition on the beam current, qualitatively similar to the stability condition for a coasting beam, is satisfied. This condition can be used to define a threshold current, and to discuss its dependence on the longitudinal coupling impedance.

32718 (SLAC-PUB—2537) **Scaling of damping rings for colliding linac beam systems.** Wiedemann, H. (Stanford Linear Accelerator Center, CA (USA)). Jun 1980. Contract AC03-76SF00515. 7p. (CONF-800740—10). NTIS, PC A02/MF A01.

From 11. international conference on high energy accelerators; Geneva, Switzerland (7 Jul 1980).

The scaling of damping rings for colliding linear accelerator beams is discussed. It was found that low repetition rates should be used to achieve the highest luminosity. Only for very high values of the repetition rate above $10^4\,sec^{-1}$ the luminosity is found to increase again with pulse repetition rate. In this regime, however, damping rings are not useful anymore and the operating cost for the facility is very high without gain in luminosity as compared to low repetition rates. Therefore for reasons of economics as well as performance low pulse repetition rates should be chosen and research and development should be denoted to solve tolerance problems encountered at these low pulse rates.

32719 **Secondary-electron time pickoff for pulsed charged-particle beams.** Haight, R.C.; Dalgas, D.R. (California Univ., Livermore (USA). Lawrence Livermore Lab.). *Nucl. Instrum. Methods;* **165**: No. 1, 55-56(15 Sep 1979).

A channel electron multiplier that detects secondary electrons emitted from a thin carbon foil is the basis of a time pickoff system used for pulsed charged-particle beams in the MeV region. This system provides reliable timing reference signals for beams of a wide range of intensities.

AUXILIARIES AND COMPONENTS

ION SOURCES

REFER ALSO TO CITATION(S) 32898

EXPERIMENTAL FACILITIES AND EQUIPMENT

REFER ALSO TO CITATION(S) 32682, 32714

32720 (ANL/NDM—53) **Neutron source investigations in support of the cross section program at the Argonne Fast-Neutron Generator.** Meadows, J.W.; Smith, D.L. (Argonne National Lab., IL (USA)). May 1980. Contract W-31-109-ENG-38. 26p. (CONF-800395—1). NTIS, PC A03/MF A01.

From Consultants meeting on neutron source properties; Degrecen, Hungary (17 Mar 1980).

Experimental methods related to the production of neutrons for cross section studies at the Argonne Fast-Neutron Generator are reviewed. Target assemblies commonly employed in these measurements are described, and some of the relevant physical properties of the neutron source reactions are discussed. Various measurements have been performed to ascertain knowledge about these source reaction that is required for cross section data analysis purposes. Some results from these studies are presented, and a few specific examples of neutron-source-related corrections to cross section data are provided. 16 figures, 3 tables.

32721 (BNL—28004) **Resonant impedance of bellows above cutoff.** Krinsky, S. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 5p. (CONF-800740—5). NTIS, PC A02/MF A01.

From 11. international conference on high energy accelerators; Geneva, Switzerland (7 Jul 1980).

Portions of document are illegible.

The perturbation method of Chatard-Moulin and Papiernik is used to calculate the longitudinal and transverse impedances, $Z(\omega)$ and $Z/\text{sub perpendicular}/(\omega)$, of a bellows. The bellows shape is defined by its radius $a(z) = a\,(1 + \epsilon s(z))$, where a is the mean radius, ϵ a small parameter, and $s(z)$ describes the convolution of the bellows. A finite wall conductivity is considered and the resonant contribution to the impedance above the cutoff frequency of the unperturbed chamber is determined, obtaining analytic approximations to the resonant frequencies, quality factors, and shunt impe-

dances. The relation Z/sub perpendicular/(ω) = (2c/a²)Z(ω)/ω, of course, does not hold as an identity, but it is found to be a useful relation for the shunt impedances, holding exactly for one family of transverse modes and providing an upper bound on the shunt impedances of the second set of transverse modes.

32722 (BNL—28013) **Design and project status of the National Synchrotron Light Source; storage rings (2.5 GeV, 0.7 GeV) for the generation of bright synchrotron radiation sources.** van Steenbergen, A. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 8p. (CONF-800740—3). NTIS, PC A02/MF A01.

From 11. international conference on high energy accelerators; Geneva, Switzerland (7 Jul 1980).

Two high intensity storage rings are being constructed at Brookhaven National Laboratory for the generation of intense fluxes of synchrotron radiation in the vuv wavelength region (700 MeV ring, λ/sub c/ = 31.5 A) and in the x-ray wavelength region (2.5 GeV ring, λ/sub c/ = 2.5 A). A description is given of the facility, the main features of the storage rings are presented and the basic parameters are enumerated. High field superconducting wigglers, to lower the short wavelength cutoff in the x-ray ring, and undulators, for flux enhancement or a free electron laser experiment will be incorporated and parameters are given here. Special design aspects to optimize the electron storage rings as dedicated synchrotron radiation sources will be emphasized and the status of the project will be given.

32723 (LBL—10972) **Air flow into the LBL Bevatron.** Williams, J.D. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Sep 1979. Contract W-7405-ENG-48. 34p. NTIS, PC A03/MF A01.

Thesis.

The Lawrence Berkeley Laboratory is currently installing an improved liner in its Bevatron. The new liner will be capable of producing a vacuum of 2 x 10^{-8} N/M² (1.5 x 10^{-10} Torr) and a temperature on the order of 12K. There has been concern for quite some time about possible damage to the liner in the event of a beam line window breaking allowing atmospheric air to rush into the vacuum. The installation of the new more fragile liner has heightened this concern. This effort is an attempt to characterize the pressure loading on the cryopanel in the event of a beam window rupture. Also of interest is the time it would take the inrushing atmospheric air to reach the tangent tank where the fragile cryopanels are located. Fast acting values placed between sections D and E at the beam line tangent tank junction are being considered as a precaution.

32724 (SLAC-PUB—2522) **Review of accelerator instrumentation.** Pellegrin, J.L. (Stanford Linear Accelerator Center, CA (USA)). May 1980. Contract AC03-76SF00515. 12p. (CONF-800740—11). NTIS, PC A02/MF A01.

From 11. international conference on high energy accelerators; Geneva, Switzerland (7 Jul 1980).

Some of the problems associated with the monitoring of accelerator beams, particularly storage rings' beams, are reviewed along with their most common solutions. The various electrode structures used for the measurement of beam current, beam position, and the detection of the bunches' transverse oscillations, yield pulses with sub-nanosecond widths. The electronics for the processing of these short pulses involves wide band techniques and circuits usually not readily available from industry or the integrated circuit market: passive or active, successive integrations, linear gating, sample-and-hold circuits with nanosecond acquisition time, etc. This report also presents the work performed recently for monitoring the ultrashort beams of colliding linear accelerators or single-pass colliders. To minimize the beam emittance, the beam position must be measured with a high resolution, and digitized on a pulse-to-pulse basis. Experimental results obtained with the Stanford two-mile Linac single bunches are included.

32725 (SLAC-PUB—2533) **Surface studies of materials for superconducting cavities.** Garwin, E.L.; Kirby, R.E.; Momose, T.; Hoyt, E.W. (Stanford Linear Accelerator Center, CA (USA)). Jun 1980. Contract AC03-76SF00515. 4p. (CONF-800928—3). NTIS, PC A02/MF A01.

From 8. international vacuum congress/ 4. international conference on surface science and 3. European conference on solid surface; Cannes, France (22 Sep 1980).

A multitechnique system has been constructed to study materials and processes used for producing high Q superconducting cavities, while constantly maintaining uhv environment. Characterization of a small disc of superconducting material, e.g. Nb, is done by a variety of methods, including AES, XPS, EID, ellipsometry, sputter profiling, and secondary electron yield measurements. The samples may be processed in situ by rf and electron bombardment heating, and ion sputtering. Sample temperatures may be held from 77K to 2500K. Coating by sputtering and evaporation, and oxidizing and nitriding are incorporated. Both AES and secondary yield measurements are accomplished using very low current electron beams and counting electronics to minimize the reduction of oxide surfaces by electrons. Computer-controlled ellipsometry allows monitoring of the temporal growth of surface layers during controlled exposure to gases. Extensive measurements have been carried out on Au, C, Pt, Nb and its oxides, nitride, and carbide. AES, secondary yield, and other measurements are presented, and trends which may enable the production of stable cavity surfaces and their simple, effective in situ regeneration while installed as accelerating cavity surfaces are discussed.

STORAGE RINGS

REFER ALSO TO CITATION(S) 32715

32726 (BNL—26731) **ISABELLE control system: design concepts.** Humphrey, J.W. (Brookhaven National Lab., Upton, NY (USA)). 1979. Contract AC02-76CH00016. 16p. (CONF-7910170—1). NTIS, PC A02/MF A01.

From Workshop on distributed computer control systems; Tampa, FL, USA (2 Oct 1979).

Portions of document are illegible.

ISABELLE is a Department of Energy funded proton accelerator/storage ring being built at Brookhaven National Laboratory (Upton, Long Island, New York). It is large (3.8 km circumference) and complicated (~ 30,000 monitor and control variables). It is based on superconducting technology. Following the example of previous accelerators, ISABELLE will be operated from a single control center. The control system will be distributed and will incorporate a local computer network. An overview of the conceptual design of the ISABELLE control system will be presented.

32727 (SLAC-PUB—2521) **Outlook for studies of gamma-gamma collisions at PEP.** Burke, D.L. (Stanford Linear Accelerator Center, CA (USA)). Jun 1980. Contract AC03-76SF00515. 10p. (CONF-800499—1). NTIS, PC A02/MF A01.

From International workshop on gamma-gamma collisions; Amiens, France (8 Apr 1980).

A preview of the two-photon physics that can be expected to result from the initial PEP program is presented. The experimental detectors are discussed with emphasis placed on their capabilities and limitations to do studies of gamma-gamma interactions. 7 figures, 1 table.

INSTRUMENTATION

RADIATION INSTRUMENTATION

GENERAL DETECTORS AND MONITORS

32728 **Ionization chamber.** Walenta, A.H. US Patent Application 098,451. [nd]. 20p.

An ionization chamber is described which has separate drift and detection regions electrically isolated from each other by a fine wire grid. A relatively weak electric field can be maintained in the drift region when the grid and another electrode in the chamber are connected to a high voltage source. A much stronger electric field can be provided in the detection region by connecting wire electrodes therein to another high voltage source. The detection region can thus be operated in a proportional mode when a suitable gas is contained in the chamber. High resolution output pulse waveforms are provided across a resistor connected to the detection region anode, after ionizing radiation enters the drift region and ionizes the gas.

32729 (LA-UR—80-1358) **Data acquisition and control for gamma scanning.** Barnes, B.K.; Murray, A.S.; Quintana, J.N. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 20p. (CONF-800693—1). NTIS, PC A02/MF A01.

From 28. conference on remote systems technology; Las Vegas, NV, USA (8 Jun 1980).

A new computer-based data acquisition and control unit has been installed in the Los Alamos Scientific Laboratory (LASL) system for scanning irradiated reactor fuel pins. The scanning mechanism is controlled by a commercial multichannel analyzer via a CAMAC link with an intelligent crate controller. The scanning and control unit consists of three linked LSI-11 computers. The multitasking capability of the commercial operation system allows control decisions to be based upon currently acquiring data.

32730 (SAND—80-0637C) **Passive neutron dosimetry on cruise missile tests.** Ewing, R.I. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 5p. (CONF-800703—5). NTIS, PC A02/MF A01.

From Annual conference on nuclear and space radiation effects; Ithaca, NY, USA (15 Jul 1980).

One of the components exercised during development tests of cruise missiles is the neutron generator that supplies the burst of neutrons needed to initiate a nuclear explosion. The subject of this report is a method of verifying the production of neutrons using a passive neutron activation technique that is sufficiently sensitive to detect a decay rate of a few atoms per hour.

32731 Gas mixtures for gas-filled particle detectors. Christophorou, L.G.; McCorkle, D.L.; Maxey, D.V.; Carter, J.G. (to Dept. of Energy). US Patent 4,201,692. 6 May 1980. Filed date 22 Jan 1979. 4p.

PAT-APPL-5,263.

Improved binary and tertiary gas mixtures for gas-filled particle detectors are provided. The components are chosen on the basis of the principle that the first component is one gas or mixture of two gases having a large electron scattering cross section at energies of about 0.5 eV and higher, and the second component is a gas (Ar) having a very small cross section at and below about 0.5 eV, whereby fast electrons in the gaseous mixture are slowed into the energy range of about 0.5 eV where the cross section for the mixture is small and hence the electron mean free path is large. The reduction in both the cross section and the electron energy results in an increase in the drift velocity of the electrons in the gas mixtures over that for the separate components for a range of E/P (pressure-reduced electron field) values. Several gas mixtures are provided that provide faster response in gas-filled detectors for convenient E/P ranges as compared with conventional gas mixtures.

32732 Miniaturized radiation chirper. Umbarger, C.J.; Wolf, M.A. (to Dept. of Energy). US Patent 4,197,461. 8 Apr 1980. Filed date 17 Aug 1978. 6p.

PAT-APPL-934,764.

A miniaturized radiation chirper for use with a small battery supplying on the order of 5 volts is described. A poor quality CdTe crystal which is not necessarily suitable for high resolution gamma ray spectroscopy is incorporated with appropriate electronics so that the chirper emits an audible noise at a rate that is proportional to radiation exposure level. The chirper is intended to serve as a personnel radiation warning device that utilizes new and novel electronics with a novel detector, a CdTe crystal. The resultant device is much smaller and has much longer battery life than existing chirpers.

32733 Position-sensitive proportional counter with low-resistance metal-wire anode. Kopp, M.K. (to Dept. of Energy). US Patent 4,197,462. 8 Apr 1980. Filed date 4 Dec 1978. 6p.

PAT-APPL-966,525.

A position-sensitive proportional counter circuit is provided which uses a conventional (low-resistance, metal-wire anode) proportional counter for spatial resolution of an ionizing event along the anode of the counther. A pair of specially designed activecapacitance preamplifiers terminate the anode ends wherein the anode is treated as an RC line. The preamplifiers act as stabilized active capacitance loads and each is composed of a series-feedback, low-noise amplifier, a unity-gain, shunt-feedback amplifier whose output is connected through a feedback capacitor to the series-feedback amplifier input. The stabilized capacitance loading of the anode allows distributed RC-line position encoding and subsequent time difference decoding by sensing the difference in rise times of pulses at the anode ends where the difference is primarily in response to the distributed capacitance along the anode. This allows the use of lower resistance wire anodes for spatial radiation detection which simplifies the counter construction and handling of the anodes, and stabilizes the anode resistivity at high count rates ($> 10^6$ counts/sec).

32734 Position sensitive transmission detector for the determination of the scattering angles at the entrance aperture of a QDDD spectrometer. Uhlhorn, C.D.; Braun-Munzinger, P.; Renner, T. (State Univ. of New York, Stony Brook (USA)); Barrette, J.; LeVine, M. (Brookhaven National Lab., Upton, NY (USA)). *Verh. Dtsch. Phys. Ges.;* No. 9, 1074(1980). (In German).

From Spring meeting Muenchen '80; Muenchen, Germany, F.R. (17 - 22 Mar 1980).

32735 ^{6}Li-salicylate neutron detectors with pulse shape discrimination. Greenwood, L.R.; Chellew, N.R. (Argonne National Lab., IL (USA)). *Nucl. Instrum. Methods;* **165**: No. 1, 129-131(15 Sep 1979).

Crystals of ^{6}Li-salicylate used alone or suspended in various plastics and liquids make excellent neutron detectors with high light output, low gamma sensitivity, and pulse shape discrimination.

HIGH ENERGY PHYSICS INSTRUMENTATION

REFER ALSO TO CITATION(S) 32727

32736 (BNL—28117) First experiences with a fastbus system at Brookhaven. Leipuner, L.B.; Larsen, R.C.; Makowiecki, D.S. (Brookhaven National Lab., Upton, NY (USA)). 14 Jul 1980. Contract AC02-76CH00016. 11p. (CONF-800724—10). NTIS, PC A02/MF A01.

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

A new concept in high energy data acquisition systems called Fastbus has been developed and implemented at Brookhaven. The system which is capable of sub-gigabit/sec speeds has been operating for some time now. A number of modules including an on-bus processor, a PDP11 interface, 32 channel coincidence latches, a 16 channel scaler, a 32 channel μ-clock device, a 60 nsec memory and a predetermined time module have been developed and built. Features of the system include extensive use of ECL logic and a water cooled crate with conduction heat transfer within a module. The system is used in an on-line experiment at the AGS. Operating experience will be discussed.

32737 (BNL—28160) Accurate computer simulation of a drift chamber. Killian, T.J. (Brookhaven National Lab., Upton, NY (USA)). 25 Mar 1980. Contract AC02-76CH00016. 19p. (CONF-800243—2). NTIS, PC A02/MF A01.

From Wire chamber conference; Vienna, Austria (27 Feb 1980).

A general purpose program for drift chamber studies is described. First the capacitance matrix is calculated using a Green's function technique. The matrix is used in a linear-least-squares fit to choose optimal operating voltages. Next the electric field is computed, and given knowledge of gas parameters and magnetic field environment, a family of electron trajectories is determined. These are finally used to make drift distance vs time curves which may be used directly by a track reconstruction program. Results are compared with data obtained from the cylindrical chamber in the Axial Field Magnet experiment at the CERN ISR.

32738 Response of a uranium-plastic calorimeter to low GeV ($<=10$ GeV) protons. Gabriel, T.A.; Bishop, B.L. (Oak Ridge National Lab., TN (USA)). *Nucl. Instrum. Methods;* **164**: No. 3, 609-611(1 Sep 1979).

The calculated response of a uranium-plastic calorimeter for incident 1-10 GeV protons is presented and compared to previously published data for a uranium-liquid argon calorimeter.

32739 High-pressure thin-window gas cell. Haight, R.C.; Rambo, C.; Cormier, J.; Garibaldi, J.L. (California Univ., Livermore (USA). Lawrence Livermore Lab.). *Nucl. Instrum. Methods;* **164**: No. 3, 613-614(1 Sep 1979).

A thin-window gas cell has been developed to contain helium at pressures to 2 MPa (20 atm). The cell is used to calibrate the efficiency of a magnetic-quadrupole charged-particle spectrometer for measuring charged particles from neutron-induced reactions.

32740 Germanium charged particle telescopes with ultra-thin detector contacts. Hubbard, G.S.; Haller, E.E. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). *Nucl. Instrum. Methods;* **164**: No. 1, 121-124(1 Aug 1979).

High-purity germanium charged particle telescopes, consisting of detectors with ultra-thin (approximately 1000 A) ion implanted p^+- and n^+-contacts and capable of stopping up to 200 MeV protons have been developed. Fixed and variable detector configurations which accommodate user needs are described. A spectrum from a ^{28}Si(p,p')^{28}Si scattering experiment demonstrates the performance of such telescopes.

32741 (ANL/AMD/TM—64) AROMA-AIRWICK: a CHLOE/CDC-3600 system for the automatic identification of spark images and their association into tracks. Clark, R.K. (Argonne National Lab., IL (USA)). [nd]. Contract W-31-109-ENG-38. 50p. NTIS, PC A03/MF A01.

The AROMA-AIRWICK System for CHLOE, an automatic film scanning equipment built at Argonne by Donald Hodges, and the CDC-3600 computer is a system for the automatic identification of spark images and their association into tracks. AROMA-AIRWICK has been an outgrowth of the generally recognized need for the automatic processing of high energy physics data and the fact that the Argonne National Laboratory has been a center of serious spark chamber development in recent years.

MISCELLANEOUS INSTRUMENTS

32742 Digital pressure transducer for use at high temperatures. Karplus, H.H.B. US Patent Application 092,154. [nd]. 9p.

A digital pressure sensor for measuring fluid pressures at relatively high temperatures includes an electrically conducting fiber coupled to the fluid by a force disc that causes tension in the fiber to be a function of fluid pressure. The tension causes changes in the

mechanical resonant frequency of the fiber, which is caused to vibrate in a magnetic field to produce an electrical signal from a positive-feedback amplifier at the resonant frequency. A count of this frequency provides a measure of the fluid pressure.

32743 (CONF-800922—1) **Plasma diagnostics approach to welding heat source/molten pool interaction.** Key, J.F.; McIlwain, M.E.; Isaacson, L. (Idaho National Engineering Lab., Idaho Falls (USA)). 1980. Contract AC07-76ID01570. 4p. NTIS, PC A02/MF A01.

From 6. international conference on gas discharges and their applications; Edinburgh, UK (8 Sep 1980).

Plasma diagnostic techniques show that weld fusion zone profile and loss of metal vapors from the molten pool are strongly dependent on both the intensity and distribution of the heat source. These plasma properties, are functions of cathode vertex angle and thermal conductivity of the shielding gas, especially near the anode.

32744 (COO—3071-244) **Large scintillation counter design with waveshifter light collection.** Theodosiou, G.; Selove, W. (Argonne National Lab., IL (USA); Pennsylvania Univ., Philadelphia (USA). Dept. of Physics). 9 May 1980. Contract AC02-76ER03071. 9p. (ANL-HEP-PR—80-27; CONF-800684—3). NTIS, PC A02/MF A01.

From International conference on experimentation at LEP; Uppsala, Sweden (16 Jun 1980).

The light collection method, scintillation and waveshifter materials, number of photoelectrons (N/sub pe/) calculation, and time resolution for a scintillator hodoscope of very large dimensions are described. This equipment is used for particle counting and time-of-flight applications and is about 5 times less expensive that aromatic scintillators. The time resolution is about +- 2/3 sec. (FS)

32745 (EGG—1183-2380) **Laboratory evaluation of a KrF laser fluorosensor.** Capelle, G.; Franks, L. (EG and G, Inc., Goleta, CA (USA). Energy Measurements Group). Sep 1978. Contract AC08-76NV01183. 41p. NTIS, PC A03/MF A01.

A laboratory version of a fluorosensor system consisting of a KrF laser, an 8-inch f/4.5 Newtonian telescope receiver fitted with a wavelength discriminator followed by a photomultiplier detector, and readout electronics, was assembled and tested. Detection sensitivity of the system was measured for two different photomultiplier tubes, a visible and a solar blind tube, used first with an optical filter and later with a small monochromator. System detectivity was measured using a solution of phenol in water and was found to be 7.5 x 10^{-8} moles/liter. Liquid effluent samples A and B, from coal processing streams, were detected at dilutions of 0.37 ml/l and 2.7 x 10^{-3} ml/l, respectively. A solution of cyclic organics obtained from the National Bureau of Standards was detected at a dilution of 3.6 x 10^{-2} ml/l. No significant variation in detectivity with photomultiplier voltage was found.

32746 (IS-T—891) **Inductively coupled plasma-atomic emission spectroscopy: a computer controlled, scanning monochromator system for the rapid determination of the elements.** Floyd, M.A. (Ames Lab., IA (USA)). Mar 1980. Contract W-7405-ENG-82. 156p. NTIS, PC A08/MF A01.

Thesis.

A computer controlled, scanning monochromator system specifically designed for the rapid, sequential determination of the elements is described. The monochromator is combined with an inductively coupled plasma excitation source so that elements at major, minor, trace, and ultratrace levels may be determined, in sequence, without changing experimental parameters other than the spectral line observed. A number of distinctive features not found in previously described versions are incorporated into the system here described. Performance characteristics of the entire system and several analytical applications are discussed.

32747 (LBL—10386) **Seismic isolation of an electron microscope.** Godden, W.G.; Aslam, M.; Scalise, D.T. (California Univ., Berkeley (USA)). Jan 1980. Contract W-7405-ENG-48. 11p. (CONF-800919—3). NTIS, PC A02/MF A01.

From 7. world conference on earthquake engineering; Istanbul, Turkey (8 Sep 1980).

A unique two-stage dynamic-isolation problem is presented by the conflicting design requirements for the foundations of an electron microscope in a seismic region. Under normal operational conditions the microscope must be isolated from ambient ground noise; this creates a system extremely vulnerable to seismic ground motions. Under earthquake loading the internal equipment forces must be limited to prevent damage or collapse. An analysis of the proposed design solution is presented. This study was motivated by the 1.5 MeV High Voltage Electron Microscope (HVEM) to be installed at the Lawrence Berkeley Laboratory (LBL) located near the Hayward Fault in California.

32748 (Y/DX—139) **Laser surface finish gauge.** Corey, H.S. (Oak Ridge Y-12 Plant, TN (USA)). 12 May 1980. Contract W-7405-ENG-26. 9p. (CONF-800719—3). NTIS, PC A02/MF A01.

From International symposium of the Society of Photo-Optical Instrumentation Engineers; San Diego, CA, USA (28 Jul 1980).

A laser surface finish gauge has been developed to measure the roughness of the entire inside surface of hemishells in the range of 4 to 10 microinches roughness average (Ra). Standards have been fabricated that allow for traceability of the gauge's measurements to the National Bureau of Standards. The gauge employs the principles of angular scatter from a laser beam and was designed to eliminate errors introduced by varying degrees of part reflectance and changes in laser intensities. A microprocessor is used to extract data from the standards and manipulate the scatter information from test parts to produce a continuous trace of the part surface roughness on a strip chart. The gauge has been installed in a product certification laboratory and a statistical evaluation made which indicates a repeatability of +- 0.5 microinch Ra.

EXPLOSIONS AND EXPLOSIVES

REFER ALSO TO CITATION(S) 32634

CHEMICAL

32749 (LA—8082) **Response of containment vessels to explosive blast loading.** Karpp, R.R.; Duffey, T.A.; Neal, T.R. (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 31p. NTIS, PC A03/MF A01.

The response of steel containment vessels to the blast loading produced by the detonation of high explosives is investigated by experiments, computations, and analysis. The vessels are thin-wall shell structures that are nearly spherical. All explosive charges are solid spheres, centrally initiated and centrally positioned within the vessels. Most of the work concerns vessels that contain, in addition to the explosive charge, air at ambient or reduced pressures. A scaling law that relates the first maximum strain occurring in the vessel wall to other relevant parameters is derived and shown to correlate the experimental data. One-dimensional, Lagrangian, finite-difference calculations are used to study the blast phenomenon and the details of the loading pulse applied to the vessel wall. The results are verified by comparisons with pressure gauge records. In addition, vessel response to the pressure loading is calculated by both finite-difference and finite-element computer codes. The two-dimensional motion, which occurs after significant wave interactions have taken place in the test vessels, can be simulated, with reasonable accuracy, by finite-element calculations. This result indicates that a predictive technique and, therefore, a design tool appear to be available with these standard calculational methods. The effects of a surrounding medium upon the peak strains occurring in a perfectly spherical vessel also are studied, and the reductions in strain caused by the inclusion of various surrounding media are estimated.

32750 (LA-UR—80-2016) **Deflagration-to-detonation transition in granular HMX.** Campbell, A.W. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 32p. NTIS, PC A03/MF A01.

Experimental studies of the deflagration-to-detonation transition (DDT) in chemical explosives, specifically, granular HMX, are reviewed. The picture of the DDT process as presented here results from an attempt to incorporate common experimental observations which have heretofore been puzzling. It differs from that presented by G.B. Kistiakowsky in that the role of convective combustion is terminated and mechanical processes are postulated as the means of continuing the reaction buildup until shock waves are formed. In order to validate this picture it will be necessary both to review the experimental literature for observations which may not be reconcilable with it, and to subject each step in the proposed DDT process to detailed scrutiny. (LCL)

32751 (MHSMP—80-34) **Particle velocity of PBX 9404 using the axially symmetric magnetic probe technique.** Campos, C.A. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Jul 1980. Contract AC04-76DP00487. 8p. NTIS, PC A02/MF A01.

The particle velocity of 1.84 g/cc density PBX 9404 was experimentally measured utilizing a scaled down axially symmetric magnetic probe technique. Calculated pressures using the simple jump conditions from measured particle velocity averaged 359 kb, which compares closely within the expected range of 354 kb calculated by the Ruby computer code and 365 kb measured by other techniques. The variables induced in the tests were to evaluate problem areas which had been identified for the most part as being associated with scaling down the probe assembly.

32752 (MHSMP—80-35) **Skid test sensitivity of cast composition B-3 at ambient and low temperatures.** Crutchmer, J.A. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Jul 1980. Contract AC04-76DP00487. 6p. NTIS, PC A02/MF A01.

The skid test sensitivity of Composition B-3 was determined using 10 kg billets at ambient and -30°C. The results indicate the cold parts are slightly less sensitive than those conditioned at ambient temperature.

32753 (MHSMP—80-36) **HNS aluminum linear shaped charge (ALSC) performance study.** Campos, C.A. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Jul 1980. Contract AC04-76DP00487. 31p. NTIS, PC A03/MF A01.

A study was performed to determine the HNS conversion process which yields the best material for use in manufacturing aluminum linear shaped charges (ALSC). Destructive testing was performed in two phases. Phase I established optimum standoff for each lot of material, and Phase II evaluated performance under varied temperature conditions. Both optimum standoff and performance were determined by measuring ALSC depth of penetration into an aluminum witness plate. Detonation velocity was also measured.

32754 (MHSMP—80-37) **^{13}C FT-NMR analysis of the isolated by-products of TATB.** Clink, G.L. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Aug 1980. Contract AC04-76DP00487. 19p. NTIS, PC A02/MF A01.

A ^{13}C NMR analysis and characterization of the isolated by-products produced in the preparation of 1,3,5-triaminotrinitrobenzene (TATB) was effected. Two additional materials, not previously reported, were isolated and identified.

32755 (MHSMP—80-39) **Compositional analysis technique for HNS/Kel-F 800.** Sandoval, J. (Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)). Aug 1980. Contract AC04-76DP00487. 7p. NTIS, PC A02/MF A01.

A compositional analysis procedure for the plastic-bonded explosive consisting of HNS and Kel-F 800 is presented. The Kel-F is determined gravimetrically after extraction of the HNS with fuming nitric acid. The HNS content is calculated by difference.

32756 (SAND—80-1839C) **LEW-II: a minicomputer controlled lightning early warning system.** Shurtleff, W.W. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 24p. (CONF-800941—1). NTIS, PC A02/MF A01.

From 19. DOD explosives safety seminar; Los Angeles, CA, USA (9 Sep 1980).

One of the problems with open-air testing using explosives is that a high static charge or nearby lightning strike has the possibility of prematurely igniting the explosives. Sandia National Laboratories has developed a system (LEW-II) which takes data from a matrix of potential gradient sensors and rebroadcasts this information to test operators using explosives. By this method, the system gives early warning of possible hazards and allows safe storage of explosive materials. The LEW-II system and its use as a hazard warning and weather data collection system are described.

NUCLEAR

WEAPONRY

32757 (LA—8255) **FPS camera sync and reset chassis.** Yates, G.J. (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 27p. NTIS, PC A03/MF A01.

The sync and reset chassis provides all the circuitry required to synchronize an event to be studied, a remote free-running focus projection and scanning (FPS) data-acquisition TV camera, and a video signal recording system. The functions, design, and operation of this chassis are described in detail.

EXPLOSION DETECTION

32758 (SAND—79-1503) **US Army Nuclear Burst Detection System (NBDS).** Glaser, R.F. (Sandia National Labs., Albuquerque, NM (USA)). Jul 1980. Contract AC04-76-DP00789. 252p. NTIS, PC A12/MF A01.

The Nuclear Burst Detection System (NBDS) was developed to meet the Army requirements of an unattended, automatic nuclear burst reporting system. It provides pertinent data for battlefield commanders on a timely basis with high reliability.

ENVIRONMENTAL SCIENCES,

ATMOSPHERIC

BASIC STUDIES

32759 (SERI/RR—744-311) **Economic measurement of environment damages.** Krawiec, F. (Solar Energy Research Inst., Golden, CO (USA)). May 1980. Contract AC02-77CH00178. 78p. NTIS, PC A05/MF A01.

The densities, energy consumption, and economic development of the increasing population exacerbate environmental degradation. Air and water pollution is a major environmental problem affecting life and health, outdoor recreation, household soiling, vegetation, materials, and production. The literature review indicated that numerous studies have assessed the physical and monetary damage to populations at risk from excessive concentrations of major air and water pollutants-sulfur dioxide, total suspended particulate matter, oxidants, and carbon monoxide in air; and nutrients, oil, pesticides, and toxic metals and others in water. The measurement of the damages was one of the most controversial issues in pollution abatement. The methods that have been used to estimate the societal value of pollution abatement are: (1) chain of effects, (2) market approaches, and (3) surveys. National gross damages of air pollution of $20.2 billion and of water pollution of $11.1 billion for 1973 are substantial. These best estimates, updated for the economic and demographic conditions, could provide acceptable control totals for estimating and predicting benefits and costs of abating air and water pollution emissions. The major issues to be resolved are: (1) lack of available noneconomic data, (2) theoretical and empirical difficulties of placing a value on human life and health and on benefits such as aesthetics, and (3) lack of available demographic and economic data.

32760 (UCID—18752) **ASCOT data base management system.** Barbieri, J.; Nyholm, R.; Castro, C.; Hill, K. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). Jul 1980. Contract W-7405-ENG-48. 22p. NTIS, PC A02/MF A01.

The ASCOT data base management system is designed to handle the data produced by both the experimental and theoretical efforts of the DOE Atmospheric Studies in Complex Terrain (ASCOT) project. The data base envisioned is hierarchically structured, sparse, and compact. Information concerning any given data file is stored in a directory file. The data base management system uses a relational data management approach. Presently three management schema are being developed for use with the data base. 5 figures.

CHEMICALS MONITORING AND TRANSPORT

REFER ALSO TO CITATION(S) 31529, 31617, 32198, 32679, 32774, 32807, 32882

32761 (ANL/EES-TM—90(Vol.2)) **In pursuit of clean air: a data book of problems and strategies at the state level. Volume 2. Federal Regions I, II, and III.** Garvey, D.B.; Streets, D.G. (Argonne National Lab., IL (USA)). Feb 1980. Contract W-31-109-ENG-38. 335p. NTIS, PC A15/MF A01.

The Clean Air Act Amendments of 1977 and EPA regulations set up stringent requirements for the control of emissions in areas where the National Ambient Air Quality Standards were being exceeded. Implementation plans have been devised by the various states for the attainment of those standards. This second volume of the five-volume series presents outlines of the plans in Federal Regions I, II, and III and maps of the nonattainment status of counties and subcounty areas in each state. Federal Region I consists of the following states: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. Federal Region II is made up of New Jersey and New York; Federal Region III is composed of Delaware, Maryland, Pennsylvania, Virginia, and West Virginia. (JGB)

32762 (BM-RI—8438) **Environmental evaluation of polyethylene oxide when used as a flocculant for clay wastes.** Zatko, J.R. (Bureau of Mines, Tuscaloosa, AL (USA)). 1980. 16p. Dept. of Interior, Washington, DC.

A method of flocculation dewatering of phosphatic clay wastes using polyethylene oxide as the flocculant is reported. Research was conducted to determine whether ethylene oxide gas was present in the air in the vicinity of disposed waste materials which had been flocculated with polyethylene oxide. Samples of clay waste materials containing polyethylene oxide were prepared in stoppered glass bottles in simulated disposal environments. Gaseous samples, removed over a 75-day period using an airtight syringe, were injected into a gas chromatograph that was capable of separating ethylene oxide from air. The presence of ethylene oxide gas was not detected in any sample. To determine possible degradation products of poly-

ethylene oxide, the properties and reactions of ethylene oxide and its polymers were reviewed. Based upon the literature survey and experimental study, it was concluded that adverse environmental effects were not likely to result from the use of polyethylene oxide for flocculating phosphatic clay waste products.

32763 (DOE/ER/05015—2) **Mechanism of gas permeation through polymer membranes. Progress report, June 1, 1979-March 31, 1980.** Stern, S.A.; Kulkarni, S.S.; Mauze, G.R. (Syracuse Univ., NY (USA). Dept. of Chemical Engineering and Materials Science). Apr 1980. Contract AS02-78ER05015. 62p. NTIS, PC A04/MF A01.

The objective is to assess the validity of a free-volume model of gas permeation through nonporous polymeric membranes (5-7). During the past report period, diffusion and solubility coefficients for CO_2, C_2H_4, and C_3H_8 in polyethylene rods have been measured at temperatures from 5° to 35°C and at pressures of up to 30 atm. Characteristic free-volume parameters were determined from these data by means of an improved computational technique. The parameters were used to predict permeability coefficients for the transport of the above gases through polyethylene membranes. The theoretical permeability coefficients were found to be in very satisfactory agreement with experimental values obtained from independent permeability measurements. Rates of permeation have also been measured for 50% CO_2-50% C_2H_4, 74.9% CO_2-25.1% C_2H_4, and 50% CO_2-50% C_3H_8 mixtures between 20 and 50°C and at pressures of up to 28 atm. The permeability coefficients for the components of the mixtures were found to be higher than those of the pure gases, as predicted by the free-volume model.

32764 (DOE/EV—0063) **Regional issue identification and assessment: study methodology. First annual report.** (Systems Consultants, Inc., Washington, DC (USA)). Jan 1980. Contract W-31-109-ENG-38. 147p. NTIS, PC A07/MF A01.

The overall assessment methodologies and models utilized for the first project under the Regional Issue Identification and Assessment (RIIA) program are described. Detailed descriptions are given of the methodologies used by lead laboratories for the quantification of the impacts of an energy scenario on one or more media (e.g., air, water, land, human and ecology), and by all laboratories to assess the regional impacts on all media. The research and assessments reflected in this document were performed by the following national laboratories: Argonne National Laboratory; Brookhaven National Laboratory; Lawrence Berkeley Laboratory; Los Alamos Scientific Laboratory; Oak Ridge National Laboratory; and Pacific Northwest Laboratory. This report contains five chapters. Chapter 1 briefly describes the overall study methodology and introduces the technical participants. Chapter 2 is a summary of the energy policy scenario selected for the RIIA I study and Chapter 3 describes how this scenario was translated into a county-level siting pattern of energy development. The fourth chapter is a detailed description of the individual methodologies used to quantify the environmental and socioeconomic impacts of the scenario while Chapter 5 describes how these impacts were translated into comprehensive regional assessments for each Federal Region.

32765 (LA—8220) **Evaluation of fast response aerosol mass monitors.** Fairchild, C.I.; Tillery, M.I.; Ettinger, H.J. (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 76p. NTIS, PC A05/MF A01.

Five commercially available mass monitors were evaluated against aerosols of coal dust, silica, fiber glass, welding fume, oil shale, polystyrene latex, dioctyl phthalate, and fluorescein dye. The instruments were two identical TSI Corporation respirable aerosol mass monitors (RAMM), model 3500, and one each of GCA Corporation respirable dust monitors (RDM), models 101, 201, and 301. The RDM-201 was a long-term sampler (sampling up to 8 h), whereas the other monitors employed sampling periods generally 2 min or less. Each mass monitor sampled from uniform aerosol concentrations ranging from <0.1 to >10 mg/m^3. The aerosols were also sampled by three membrane filters collecting 2, 5, and 20 to 37 L/min. Mass monitor readings were compared to gravimetric concentrations of samples between 1- to 10-min duration. Statistical techniques were applied to determine significant differences between gravimetric and mass monitor results. The RDM-201 mass monitor displayed zero mass concentration of 27 of 73 measurements and an accuracy of +-74% for 27 other measurements, when gravimetric information indicated mass concentrations ranging from 0.3 to 5 mg/m^3. Accuracy of the other monitors was better than +-25% of gravimetric concentration when four or more instrument readings were averaged; however, individual readings differed from gravimetric concentration as much as 300%. Particle size sensitivities of the monitors, indicated by the particle size of 50% measurement efficiencies, were 1.2- and 1.4-μm aerodynamic diameter for the RDM-301 and -101, respectively, and <0.3 μm for the RAMMs. The RAMMs collected particles >6-μm aerodynamic diameter with poor efficiency.

32766 (LMF—73) **Diesel exhaust emissions toxicology program. Status report, January 1980.** McClellan, R.O. (ed.). (Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (USA)). Jan 1980. Contract AC04-76EV01013. 25p. NTIS, PC A02/MF A01.

The current status of the Department of Energy's (DOE) Office of Environment (EV) research programs to assess the environmental acceptability of diesel engines is reviewed. The EV research effort consists of activities in the following five inter-related areas: studies to establish the physical, chemical, and biological characteristics of emissions from different vehicles over a range operating conditions, fuel types and control devices; evaluations to predict the transport and transformation of diesel exhaust as it moves from vehicles to the breathing zone of man; research to predict the inhalation, deposition, retention and fate in the body of diesel exhaust particles and the organic compounds that are an integral part of the particles; chronic exposure of laboratory animals to graded levels of diesel exhaust to determine the potential of these exposures for causing cancer or functional disorders, especially the resiratory tract, over the lifetime of the animals; and development of an integrated risk assessment that brings together all relevant information to predict emissions, exposure atmospheres, effective dose to critical tissues, and health effects in man for various scenarios of diesel vehicle production and deployment.

32767 (PNL-SA—7944) **Model predictions and a summary of dry deposition velocity data.** Sehmel, G.A. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Aug 1979. Contract AC06-76RL01830. 29p. (CONF-791090—8). NTIS, PC A03/MF A01.

From Symposium on potential environmental and health effects of atmospheric sulfur deposition; Gatlinburg, TN, USA (14 Oct 1979).

Literature values of independent measurements of dry deposition velocities are summarized as a function of particle diameter and gas speciation. In most of the experiments reported in the literature, there are uncertainties that have hindered the development of general predictive deposition velocity models. However, one model (Sehmel and Hodgson, 1978) offers a more useful approach for predicting particle dry deposition velocities as a function of particle diameter, friction velocity, aerodynamic surface roughness, and particle density.

32768 (PNL-SA—8009) **Review of Gaussian diffusion-deposition models.** Horst, T.W. (Battelle Pacific Northwest Labs., Richland, WA (USA)). 1979. Contract AC06-76RL01830. 13p. (CONF-791090—9). NTIS, PC A02/MF A01.

From Symposium on potential environmental and health effects of atmospheric sulfur deposition; Gatlinburg, TN, USA (14 Oct 1979).

The assumptions and predictions of several Gaussian diffusion-deposition models are compared. A simple correction to the Chamberlain source depletion model is shown to predict ground-level airborne concentrations and dry deposition fluxes in close agreement with the exact solution of Horst.

32769 (PNL-SA—8080) **Experimental techniques for dry deposition measurements.** Droppo, J.G. (Battelle Pacific Northwest Labs., Richland, WA (USA)). Oct 1979. Contract AC06-76RL01830. 24p. (CONF-791090—10). NTIS, PC A02/MF A01.

From Symposium on potential environmental and health effects of atmospheric sulfur deposition; Gatlinburg, TN, USA (14 Oct 1979).

Recent experimental approaches for measurement of dry surface fluxes of sulfur compounds are reviewed and discussed with emphasis on surface layer studies. Evidence indicates that natural surfaces are sources as well as sinks for sulfur. Field results are related to requirements and implications in future studies of surface sulfur fluxes.

32770 **Development of an arsenic trioxide vapor and arsine sampling train.** Crecelius, E.A. (Marine Research Lab., Sequim, WA); Sanders, R.W. Contract DE-AC06-76RL0 1830. *Anal. Chem.;* **52**: No. 8, 1310-1312(1980).

A sampling train was evaluated using ^{76}As tracer for the measurement of particulate arsenic, arsine, and arsenic trioxide vapor in air and industrial process gas streams. In this train, a demister was used to remove droplets of water and oil, and particulates were removed by a filter. Vapor arsenic trioxide was collected in an impinger solution, and arsine gas was collected on silvered quartz beads. Hydrogen sulfide gas did not reduce the arsine trapping efficiency of the silvered beads, and charcoal proved to be an effective trap for both arsine and arsenic trioxide vapor. 1 figure, 2 tables.

RADIOACTIVE MATERIALS MONITORING AND TRANSPORT

REFER ALSO TO CITATION(S) 32640

32771 (DOE/TIC—11228) **Computer codes for environmental assessments.** Little, C.A. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 58p. NTIS, PC A04/MF A01.

Computer codes used for various phases of radiological environmental assessment are discussed. Particular transport pathways include atmospheric dispersion, surface water flow, and groundwater flow. Codes which include terrestrial and aquatic food chains and human dietary and behavioral factors are identified. There are several codes that calculate dose equivalent from both external and internal sources. Where possible, the language, appropriate computers and documentation for each code are identified.

32772 (EPA—600/7-80-019) **Radiometric method for the determination of uranium in soil and air: single-laboratory evaluation and interlaboratory collaborative study.** Casella, V.R.; Bishop, C.T.; Glosby, A.A. (Mound Facility, Miamisburg, OH (USA)). Feb 1980. Contract AC04-76DP00053. 53p. NTIS, PC A04/MF A01.

Results of a single-laboratory evaluation and an interlaboratory collaborative study of a method for determining uranium isotopes in soil and air samples are presented. The method is applicable to 10-gram soil samples and to both glass fiber and polystyrene (Microsorban) air filter samples. Sample decomposition is accomplished with a nitric-hydrofluoric acid dissolution. After a solvent extraction step to remove most of the iron present, the uranium is isolated by anion exchange chromatography and electrodeposition. Alpha spectrometry is used to measure the uranium isotopes. Two soil samples, a glass fiber air filter sample, and a polystyrene air filter sample were used to evaluate the method for uranium concentrations ranging from a few tenths to about one hundred disintegrations per minute per sample. Tracer recoveries for the single-laboratory evaluation averaged 78%, while the tracer recoveries for the collaborative study averaged 66%. Although the precision of the collaborative study results did not approach counting statistics errors, the measured uranium concentrations for these samples agreed to within 5% of the reference concentrations when the uranium concentration was greater than one disintegration per minute per gram of soil or one disintegration per minute per air filter.

32773 (K/PO/SUB—79/31057/1) **Airborne uranium, its concentration and toxicity in uranium enrichment facilities.** Thomas, J.; Mauro, J.; Ryniker, J.; Fellman, R. (Envirosphere Co., New York (USA)). Feb 1979. Contract W-7405-ENG-26. 104p. NTIS, PC A06/MF A01.

The release of uranium hexafluoride and its hydrolysis products into the work environment of a plant for enriching uranium by means of gas centrifuges is discussed. The maximum permissible mass and curie concentration of airborne uranium (U) is identified as a function of the enrichment level (i.e., U-235/total U), and chemical and physical form. A discussion of the chemical and radiological toxicity of uranium as a function of enrichment and chemical form is included. The toxicity of products of UF_6 hydrolysis in the atmosphere, namely, UO_2F_2 and HF, the particle size of toxic particulate material produced from this hydrolysis, and the toxic effects of HF and other potential fluoride compounds are also discussed. Results of an investigation of known effects of humidity and temperature on particle size of UO_2F_2 produced by the reaction of UF_6 with water vapor in the air are reported. The relationship of the solubility of uranium compounds to their toxic effects was studied. Identification and discussion of the standards potentially applicable to airborne uranium compounds in the working environment are presented. The effectiveness of High Efficiency Particulate (HEPA) filters subjected to the corrosive environment imposed by the presence of hydrogen fluoride is discussed.

SITE RESOURCE AND USE STUDIES

REFER ALSO TO CITATION(S) 32756

REGULATIONS

32774 (ANL/EES-TM—90(Vol.1)) **In pursuit of clean air: a data book of problems and strategies at the state level. Volume 1. Introduction and summary.** Garvey, D.B.; Streets, D.G. (Argonne National Lab., IL (USA)). Feb 1980. Contract W-31-109-ENG-38. 86p. NTIS, PC A05/MF A01.

Information on the new source review procedures and the emission limitations for sulfur dioxide (SO_2) and total suspended particulates (TSP) that applied to fuel combustion was gathered for all 48 contiguous states and is presented in volumes 2 to 5, organized by Federal Region. This summary volume (Vol. 1) provides an overview of the detailed material, discussing the regulatory and legislative background of nonattainment and the requirements for SIPs for nonattainment areas, and examines nonattainment problems and strategies for attainment, on the basis of the material on revised SIPs in the state-by-state volumes.

ENVIRONMENTAL SCIENCES, TERRESTRIAL

BASIC STUDIES

REFER ALSO TO CITATION(S) 32857, 32884

32775 (CONF-800634—2) **Structural identification.** Travis, C.C.; Haddock, G. (Oak Ridge National Lab., TN (USA); Missouri Univ., Rolla (USA). Dept. of Mathematics). 1980. Contract W-7405-ENG-26. 11p. NTIS, PC A02/MF A01.

From International conference on nonlinear phenomena in mathematical sciences; Arlington, TX, USA (16 Jun 1980).

A problem which constantly recurs when developing mathematical models of biological systems is that some model parameters are unknown. A natural question that arises is whether these unknown parameters can be estimated from observations of the response of the biological system to a pulse input. Parameter identification techniques have been developed to answer this question. These techniques determine a set of model parameters which can be used to simulate the observed biological system response mathematically.

32776 (CONF-7905135—) **Role of organic soils in the world carbon cycle: problem analysis and research needs.** Armentano, T.V. (ed.). (Institute of Ecology, Indianapolis, IN (USA)). Feb 1980. Contract AC02-79EV10040. 38p. NTIS, PC A03/MF A01.

From Conference on the role of organic soil in the world carbon cycle; Indianapolis, IN, USA (7 May 1979).

In May 1979, The Institute of Ecology held a workshop to determine the role of organic soils in the global carbon cycle and to ascertain their past, present and future significance in world carbon flux. Wetlands ecologists and soil scientists who participated in the workshop examined such topics as Soils as Sources of Atmospheric CO_2, Organic Soils, Primary Production and Growth of Wetlands Ecosystems, and Management of Peatlands. The major finding of the workshop is that the organic soils are important in the overall carbon budget. Histosols and Gleysols, the major organic soil deposits of the world, normally sequester organic carbon fixed by plants. They may now be releasing enough carbon to account for nearly 10% of the annual rise in atmospheric content of CO_2.

32777 (COO—1599-173) **Phenotypic and genotypic components of growth and reproduction in Typha latifolia: experimental studies in three contrasting marshes.** Grace, J.B. (Michigan State Univ., East Lansing (USA). Dept. of Botany and Plant Pathology). 1980. Contract AS02-76EV01599. 60p. NTIS, PC A04/MF A01.

Thesis.

The magnitude and causes of intraspecific variation in biomass production and allocation, and morphology for Typha latifolia L. from three marshes which can be distinguished by their successional maturity were investigated. The first stage of investigation was to determine the environmental characteristics of the three marshes and the characteristics of the T. latifolia populations. Second, in situ studies of ^{14}C fixation and allocation were used to determine the phenotypic variation in biomass production and allocation. Third, populations were sampled for genotypic variation in biomass allocation patterns by comparing growth in controlled garden experiments. Fourth, the growth of different biotypes was compared by transplantation into natural stands of T. latifolia. And fifth, the intraspecific variations were considered in terms of their consequences for the persistence of T. latifolia in habitats over successional time.

32778 **Variability of minesoils and natural soils in southeastern Montana.** Schafer, W.M. (Montana State Univ., Bozeman). *Soil Sci. Soc. Am. J.;* **43**: No. 6, 1207-1212(Nov 1979).

A study of minesoil variability near Colstrip, Montana, showed that different kinds of soils exist within mine areas, and that individual soil bodies are large enough to map at a scale of > 1:10,000. Minesoils were more variable than natural soils at the local scale (0 to 10 m lateral spacing), while natural soils were more variable at the landscape scale (> 500 m lateral spacing). Fourteen soil families were recognized in a 300-ha natural landscape while only two soil families were found on mined land. Variation in natural soil properties was correlated with geomorphic variables while minesoil variability was related to mining and reclamation methods. Problems were encountered while attempting to classify soils according to Soil Taxonomy.

32779 (ORO—4180-9) **Studies of Elymus mollis directed toward its use in revegation of maritime tundra.** Williams, M.P. (Tennessee Univ., Knoxville (USA)). Mar 1980. Contract AS05-76EV04180. 139p. NTIS, PC A07/MF A01.

Thesis.

Selection of suitable species, which will survive the severe environment of low light, cool temperatures, and high winds, poses

serious problems to revegetation programs in the Aleutian Islands. Selection must be based on adaptability of plants to the extremes of the Aleutian climate and, as realized more recently, on lack of disruption of the natural ecosystem. This places the emphasis on use of native species in revegetation. Elymus mollis Trin., American dunegrass, a dominant of the Aleutian dune community, was studied to better understand its potential for use in reclamation work. As the species occupies both beach and inland sites, an emphasis was placed on documenting its wide latitude of habitat occurrence. Community composition, dispersal, growth response, ecotypic variation, and nutrient relations were studied at two beach sites and two inland sites on Adak Island in the central Aleutian Islands in the 1977 and 1978 growing seasons.

32780 (UCRL—52889) **Hazard index for underground toxic material.** Smith, C.F.; Cohen, J.J.; McKone, T.E. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Jun 1980. Contract W-7405-ENG-48. 151p. NTIS, PC A08/MF A01.

To adequately define the problem of waste management, quantitative measures of hazard must be used. This study reviews past work in the area of hazard indices and proposes a geotoxicity hazard index for use in characterizing the hazard of toxic material buried underground. Factors included in this index are: an intrinsic toxicity factor, formulated as the volume of water required for dilution to public drinking-water levels; a persistence factor to characterize the longevity of the material, ranging from unity for stable materials to smaller values for shorter-lived materials; an availability factor that relates the transport potential for the particular material to a reference value for its naturally occurring analog; and a correction factor to accommodate the buildup of decay progeny, resulting in increased toxicity.

32781 **Influence of environmental gradients on ecosystem stability.** Smith, O.L. (Oak Ridge National Lab., TN). *Am. Nat.;* **116**: No. 1, 1-24(Jul 1980).

Ecosystems with gradients that produce nonuniform growth and death rates and which are therefore rich in spatial detail were studied to (1) show how system parameters such as growth rate, death rate, and movement of reproductive biomass (e.g., seeds) through a distributed system influence stability and stability-related dynamics; (2) determine how the nature of the gradient (steepness and shape) influences stability; and (3) determine rigorous guidelines for reducing a space-time system to the popular pure time representation, that is, determine criteria and formulas for averaging parameter data and simulating the nonuniform system by an equivalent average that has basically the same dynamic behavior. The work begins with a theoretical development, and the results are compared with those from a variety of experiments in the literature to demonstrate points of agreement as well as to offer interpretations of experimental observations.

CHEMICALS MONITORING AND TRANSPORT

REFER ALSO TO CITATION(S) 31584, 32764

32782 (DOE/BETC/OR—14) **Systematic study of metal ion sorption on selected geologic media. Annual report, October 1978-December 1979.** Meyer, R.E.; Burtch, F.W. (Oak Ridge National Lab., TN (USA); Department of Energy, Bartlesville, OK (USA). Bartlesville Energy Technology Center). Jun 1980. 85p. NTIS, PC A05/MF A01.

This report summarizes results of the past fifteen months of research in the programs Selection of Multiple Tracers for Enhanced Oil Recovery Systems and that portion of Ion Exchange Characteristics of Enhanced Oil Recovery Systems concerned with alkaline earth ion-alkali ion equilibria on clay minerals. Because of funding reductions, we have suspended further activity in these areas except for a small amount of research necessary to complete a few topics. This report therefore represents essentially a final report on these adsorption studies. An extensive study was completed of the distribution of Na(I) and Ca(II) ions between a common clay, montmorillonite, as well as several other clays, and a series of solutions of constant total ionic strength (I) with varying ionic strength fraction of sodium. Distribution coefficients for Sr(II) were determined for a variety of conditions on various clay minerals and oxides. In general for clay minerals, the values of D/sub Sr/ decrease sharply with salinity and except for kaolinite are fairly independent of pH. For adsorption of Sr(II) on oxides, values of D tend to depend only slightly on salinity but increase sharply with pH. For I^- adsorption on a large number of rocks and minerals, with few exceptions low values of D are found. Distribution coefficients have also been measured for Ni(II), Zn(II), Co(II), and Cd(II). For adsorption of these ions on montmorillonite, it was found that distribution coefficients were highly dependent on both pH and loading. For Cd(II) in solutions of high chloride concentration where Cd(II) forms chloride complexes, the values of D are lower than in non-complexing media. These adsorption studies serve to define conditions under which these ions may or may not serve as good tracers.

RADIOACTIVE MATERIALS MONITORING AND TRANSPORT

REFER ALSO TO CITATION(S) 32771, 32811

SOIL

REFER ALSO TO CITATION(S) 31629, 31634, 31691, 31693, 31696, 31697, 32772

32783 (DOE/CEA/BMFT—8) **Calculation of pollutant transfer in an aquifer TRIDISOL A1, A2, and 3 codes. Report DSN No. 270.** Madoz-Escande, C. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Surete Nucleaire). Jan 1979. 37p. (In French). NTIS (US Sales Only), PC A03/MF A01.

This report describes the TRIDISOL A1, A2, and 3 codes which use a 3.D solution of the transfer equation to obtain for a given point the arrival time and the concentration of a radionuclide for a given release in the ground. More exactly, the TRIDISOL A1 and A2 codes are written to search automatically for some physical parameters of the aquifer and ground-water (diffusion coefficients) from results obtained with tracer tests. The TRIDISOL 3 can be used as a previsional calculation model for pollution transfer in the aquifer, the physical parameters of which were previously determined with TRIDISOL A1 and A2 codes. Examples of use of the code for various pollutant releases are given.

32784 (DOE/CEA/BMFT—9) **Method for previsional evaluation of pollutant transfers in an aquifer. First results obtained in a sandy environment (at the BARP workings, GIRONDE). Report DSN No. 261.** Madoz-Escande, C.; Peyrus, J.C. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Surete Nucleaire). 1979. 17p. (In French). NTIS (US Sales Only), PC A02/MF A01.

The hydrogeological studies undertaken within the framework of the radiological safety of nuclear facilities aim, in particular, at quantitatively predicting the consequences of the accidental release of radioactive pollutants into an aquifer. Such a quantitative forecasting is arrived at through a mathematical model based on sequential emission, the use of which requires a knowledge of the physical parameters of the aquifer and an understanding of pollutant behavior in relation to the aquiferous environment. The physical parameters of a saturated porous environment are brought into light by means of radioactive tracer tests on mock-up as well in the field. The first results obtained in a sandy environment (BARP workings) are presented. The difficulty of extrapolating mock-up test results to actual field conditions has, more particularly, made it necessary to commission a mobile laboratory fitted for in situ studies.

32785 (DOE/ET/44206—1) **Pollution of ground water due to inactive uranium mill tailings. Summary of progress, October 1, 1979-September 30, 1981.** (Colorado Univ., Denver (USA). Center for Environmental Studies). 1980. Contract AC02-76ET44206. 50p. NTIS, PC A03/MF A01.

An extensive program of characterization of several inactive uranium tailings piles has been carried out in the past year. The geotechnical engineering program conducted a drilling program at the Salt Lake City and Grand Junction sites. The locations of slimes and sands in these sites hve been characterized. In general, it was found that slimes exist in the impoundments in lower percentages than normally produced from mill tailings. Permeability tests were conducted yielding values ranging from 10^{-3} cm/sec to 10^{-6} cm/sec. The geochemical studies made considerable progress in the past year. Extensive sampling of several sites was conducted. Sampling programs have been completed for seven sites and are underway for nine other sites. The work to date has indicated the importance of salts in controlling the direction and rate of movement of contaminants. The work has also indicated that a number of non-radioactive elements such as As are of environmental importance. The work also indicates the importance of the fact that the tailings piles are out of chemical equilibrium with their environment. Computer software was developed and implemented for data storage and retrieval. Automation hardware was installed and tested for the Inductively Coupled Plasma Emission Spectrometer. A number of analytical protocols were developed for routine analyses. A comprehensive quality control program was implemented. More than 18,000 chemical analyses were performed.

32786 (RHO-SA—97) **Toxic materials availability in perspective.** Bruns, L.E. (Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations). Mar 1979. Contract AC06-77RL01030. 16p. (CONF-790204—13). NTIS, PC A02/MF A01.

From Symposium on waste management and fuel cycles 1979; Tucson, AZ, USA (28 Feb 1979).

Public safety assurance depends on availability of toxic substances, not just their toxicity as shown by hazards available (HA) = transport factors (TF) + hazard index (HI). Each term is in orders of magnitude or log base 10. An HA of zero or log 1 is the amount that can be inhaled or ingested routinely without measurably life shortening. Each portion of the equation is reviewed for credibility and further work necessary is described.

TERRESTRIAL ECOSYSTEMS AND FOOD CHAINS

REFER ALSO TO CITATION(S) 32865

SITE RESOURCE AND USE STUDIES

REFER ALSO TO CITATION(S) 31560, 31613, 31621, 31622, 31623, 31624, 31628, 31698, 32373, 32419, 32778, 32890

32787 (LA—8390-MAP) **Reconnaissance geologic map of the northern Kawich and southern Reveille ranges, Nye County, Nevada.** Gardner, J.N.; Eddy, A.C.; Goff, F.E.; Grafft, K.S. (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 62p. NTIS, PC A04/MF A01.

A geological survey was performed in Nye County, Nevada. Results of that survey are summarized in the maps included. The general geology of the area is discussed. Major structures are described. The economics resulting from the mineral exploitation in the area are discussed. The hydrogeology and water chemistry of the area are also discussed.

REGULATIONS

REFER ALSO TO CITATION(S) 31618

32788 **Coal mine point source category effluent guidelines and standards.** *Fed. Regist. (Wash., D.C.);* **42**: No. 80, 21380-21390(26 Apr 1977).

The Environmental Protection Agency (EPA) has promulgated final effluent limitations guidelines for the coal mining point source category which contain substantial changes from the interim guidelines. These guidelines will be incorporated in National Pollutant Discharge Elimination System permits. The guidelines only apply to active mining areas and do not affect mines where reclamation has been commenced or completed. Effluent limitations representing the degree of reduction attainable by the application of the best practicable control technology currently available are established for coal preparation plants and associated areas and for the subcategories of acid or ferruginous mine drainage and alkaline mine drainage. Limitations are set for the allowable pollutant concentrations for iron, manganese, TSS and pH. The regulations do not cover pretreatment standards for coal mining point source categories. Appendices to the regulation include a summary of the legal authority for the regulations, a technical, summary and basis for the regulations, and a summary of public comments and participation.

ENVIRONMENTAL SCIENCES, AQUATIC

BASIC STUDIES

REFER ALSO TO CITATION(S) 31536, 32780, 32805, 32868

32789 (CONF-790705—2) **Automatic radio telemetry recording of fish temperature and depth.** Ross, M.J.; Kuechle, V.B.; Reichle, R.A.; Siniff, D.B. (Minnesota Univ., Minneapolis (USA)). 1979. Contract AS02-76EV01332. 10p. NTIS, PC A02/MF A01.

From International conference on wildlife biotelemetry; Laramie, WY, USA (30 Jul 1979).

Radio frequency fish transmitters capable of relaying temperature or pressure information and a multichannel recording system were developed and used successfully in the field. Both transmitters operated on pulse rate variation with either temperature or depth. Design considerations for temperature and pressure dependant pulse rates are discussed, including power supply variation, sensitivity ranges, drift, size, power consumption and temperature variation. The receiving-recording system is described, including a 16 channel programmable scanning receiver and a pulse decoder.

32790 (CONF-790705—3) **Use of microprocessor to locate fish in experimental channels.** Kuechle, L.B.; Reichle, R.A.; Zinnel, K.E.; Ross, M.J. (Minnesota Univ., Minneapolis (USA). Cedar Creek Lab.). 1979. Contract AS02-76EV01332. 7p. NTIS, PC A02/MF A01.

From International conference on wildlife biotelemetry; Laramie, WY, USA (30 Jul 1979).

An RCA 1802 microprocessor is used to locate fish in a 400 m outdoor experimental channel at the US EPA Monticello Ecological Research Station. The system consists of horizontally polarized antennas spaced at 30m intervals. The antennas are sequentially switched into a microprocessor controls all timing, switching and maeasurement functions. Each fish in this system is tagged with a rf tag which has a unique frequency in the 53 MHz band. Selecting a particular fish for tracking is equivalent to changing the frequency tuned on the receiver. A microprocessor determines the antenna sending the maximum signal level and prints out this data along with fish number and time of day. A signal to noise margin is calculated by comparing the average signal level to the signal level from the antenna closest to the fish.

32791 (COO—1599-174) **Investigation on the occurrence and significance of cyclic adenosine 3':5'-monophosphate in phytoplankton and natural aquatic communities.** Francko, D.A. (Michigan State Univ., East Lansing (USA). Dept. of Botany and Plant Pathology). 1980. Contract AS02-76EV01599. 106p. NTIS, PC A06/MF A01. Thesis.

This study is an investigation into the occurrence and potential functions of cyclic adenosine 3':5'-monophosphate (cAMP), a potent and ubiquitous metabolic regulatory molecule in heterotrophic organisms, in phytoplankton and in natural aquatic communities. Laboratory-cultured phytoplankton were grown under both optimal and suboptimal nutrient regimes under constant temperature and illumination regimes. Cellular and extracellular cAMP production, characterized by a number of biochemical techniques, was correlated with growth rate dynamics, chlorophyll a synthesis, ^{14}C-bicarbonate uptake, alkaline phosphatase activity, and heterocyst formation. The blue-green alga Anabaena flos-aquae was used as a model system in the examination of these metabolic variables. Additionally, this alga was used to test the effects of perturbation of cAMP levels on the aforementioned metabolic variables. Investigations on the occurrence and seasonal dynamics of cAMP in aquatic systems were conducted on Lawrence Lake, a hardwater oligotrophic lake, and on Wintergreen Lake, a hardwater hypereutrophic lake, both in southwestern Michigan. Putative cAMP from both systems was characterized by several biochemical techniques. Weekly sampling of particulate and dissolved cAMP in the epilimnia of both lakes was correlated with data on the rates of primary productivity, alkaline phosphatase activity, chlorophyll a synthesis and changes in phytoplankton community structure.

32792 (COO—1599-177(Pt.4)) **Investigation on the occurrence and significance of cyclic adenosine 3':5'-monophosphate in phytoplankton and natural aquatic communities.** Francko, D.A. (Michigan State Univ., East Lansing (USA). Dept. of Botany and Plant Pathology). 1980. Contract AS02-76EV01599. 105p. NTIS, PC A06/MF A01.

Thesis.

This study demonstrates, on the basis of several analyanalytical criteria, that the production and extracellular release of cyclic adenosine 3':5'-monophosphate (cAMP) is widespread among phytoplankton species. The production and release of CAMP varied markedly among different species grown under similar environmental conditions, and intraspecifically during the life cycle of a given algal species. This investigation marks the first time cAMP has been investigated in natural aquatic systems. An examination of epilimnetic lakewater samples from Lawrence Lake, a hardwater oligotrophic lake, and Wintergreen Lake, a hardwater hypereutrophic lake, both in southwestern Michigan, demonstrated that cAMP existed in both particulate-associated and dissolved forms in these systems.

32793 (DOE/EV/10250—T1) **Lagrangian and Eulerian diffusion study in the coastal surface layers. Progress report, July 1, 1979-June 30, 1980.** Carter, H.H.; Okubo, A.; Wilson, R.E.; Sanderson, B.; Pritchard, D.W. (State Univ. of New York, Stony Brook (USA). Marine Sciences Research Center). Jul 1980. Contract AS02-79EV10250. 52p. NTIS, PC A04/MF A01.

This research project addresses a fundamental problem in turbulence theory, the relation between Lagrangian and Eulerian statistics, by carrying out, analyzing, and interpreting a set of field experiments in the coastal waters off the south shore of Long Island. The study will not only provide information on the relation between the Lagrangian and Eulerian autocorrelations but also between the various experimental methods for quantitatively estimating turbulent diffusion. Two experiments, one in summer and one in winter, consisting of simultaneous measurements of dye diffusion, drogue dispersion, and Eulerian current velocities in a typical coastal locale were planned. In order to ensure a match between the Lagrangian (drogues, dye) scales of motion and the Eulerian (current meters)

scales, however, a preliminary experiment, consisting of a 6 mooring current meter array and a short (~ 3 hours) drogue experiment, was conducted during March 1980. Results of this preliminary experiment and their implications to the experimental program are discussed. The principal results were an improved design of our current meter array, and a wider variety of drogue experiments, i.e., multi-level, multi-scale, and continuous source simulation.

32794 (DOE/EV/10331—T1) **Nearshore transport processes affecting the dilution and fate of energy-related contaminants. Progress report, October 1, 1979-September 30, 1980.** Blanton, J.O. (Skidaway Inst. of Oceanography, Savannah, GA (USA)). 15 Jul 1980. Contract AS09-80EV10331. 273p. NTIS, PC A12/MF A01.

Research was conducted on physical oceanograhic processes off the Georgia Coast. Spatral variations in momentum and salt flux were measured to determine their importance in generating flow and salt transport. Analyses of data are presently underway.

32795 (FWS/OBS—80/30) **Proceedings of the Gulf of Mexico coastal ecosystems workshop.** Fore, P.L.; Peterson, R.D. (eds.). (Texas Univ., Port Aransas (USA). Marine Science Inst.). May 1980. 221p. (CONF-7909141—). Fish and Wildlife Service, Office of Environment, Region 2, Albuquerque, NM.

From Gulf of Mexico coastal ecosystems workshop; Port Aransas, TX, USA (4 Sep 1979).

Fourteen presentations are included in the workshop. Six were abstracted and indexed individually for EDB/ERA. (JGB)

32796 (FWS/OBS—80/30, pp 67-96) **Role of seagrasses in estuarine systems.** Phillips, R.C. (Seattle Pacific Univ., WA). May 1980.

From Gulf of Mexico coastal ecosystems workshop; Port Aransas, TX, USA (4 Sep 1979).

Research conducted on seagrasses from an ecosystem perspective is reported. This study is providing data for explaining patterns of development and activity in seagrass ecosystem processes such as productivity, phenology, and nutrient cycling. It is becoming clear that seagrass meadows form highly productive ecosystems with a suite of both biological and physical functions which greatly transcend the boundaries of the actual seagrass community. Despite the adaptive responses of seagrasses to a fluctuating environment, several human-related activities have taxed the ability of plants to persist. Those discussed include dredging, eutrophication, temperature and salinity, wind and sea stress, population explosions and overgrazing, oil pollution, as well as pollution from metals and other materials. Recommendations for future research are presented. (JGB)

32797 (FWS/OBS—80/30, pp 123-145) **Ecology of the Texas Gulf of Mexico shelf.** Flint, R.W. (Marine Science Institute, Port Aransas, TX). May 1980.

From Gulf of Mexico coastal ecosystems workshop; Port Aransas, TX, USA (4 Sep 1979).

Results of environmental studies on the south Texas outer continental shelf are reported. These multidisciplinary studies focused on establishing a basis of environmental information against which to check future shelf perturbations from energy exploitation activities. The Texas shelf was found to be influenced by a host of complex hydrographic features which were driven by seasonal climatological variability. Several distinct water masses on the shelf were hypothesized from the patterns observed between primary producer biomasses (chlorophyll) and salinity. The inner-shelf habitats appeared to be more dynamic in biological properties than habitats further out on the shelf. These differences may be related to local estuarine influences as suggested by the water mass characterizations. In these shallow, more productive waters, trophic coupling between the pelagic and benthic components of the ecosystem were examined, focusing on an economically important commercial fishery, shrimp. Using data from several sources, including the studies mentioned above, a food web was constructed for inner-shelf waters. It was concluded from this exercise that the majority of water column primary production is diverted to the benthic component of the ecosystem (detrital pool). This detrital pool provides much of the nutrition required by the demersal fisheries. The role of benthic infauna, both as a food source in this hypothesized web and as a factor influencing the general dynamics of the benthic detrital pool, are discussed.

32798 (ORO—3801-11) **Ecology of subtropical, shallow water environments: chemistry of copper and chlorine introduced into marine systems during energy production. 3 year report, 1 October 1977-30 September 1980.** Carpenter, J.H. (Miami Univ., FL (USA). Rosenstiel School of Marine and Atmospheric Sciences). 1980. Contract AS05-76EV03801. 54p. NTIS, PC A04/MF A01.

Results of research on the chemistry of the copper binding compounds occurring in coastal seawater are reported. Initially efforts were oriented towards the study of the complexing capacity of waters collected at various localions in the Miami, Florida area. The study then shifted towards the concentration and the elucidation of these chelators. Results are reported under the following section headings: complexing capacity - assessment of the complexing capacity of local waters; the effects of chlorination on the complexing capacity; and measurement of copper demand; concentration of the natural occurring organic matter - solvent extraction of copper complexes, solid support concentration techniques, and ultrafiltration; size exclusion chromatography of metal complexes; and, separation of the organics. (JGB)

32799 (SAND—80-6015) **Sediment transport and turbulence.** Bosse, G. (Sandia National Labs., Albuquerque, NM (USA)). Jul 1980. Translation of BMVg-FBWT—71-5. 34p. NTIS, PC A03/MF A01.

In order to understand the interaction between water current and seabottom sediment in shallow water areas, it is necessary to investigate theoretically and experimentally the resulting turbulent motion and the energy dissipative processes of sediment transport and ripple formation. Possible ways to achieve this goal are indicated.

32800 **Egg production of a marine planktonic copepod in relation to its food supply: laboratory studies.** Checkley, D.M. Jr. (Univ. of California, San Diego). *Limnol. Oceanogr.;* **25**: No. 3, 430-446(May 1980).

Egg production by Paracalanus parvus, a particle-grazing copepod, was investigated in relation to its food supply. The concentration of available food (P) and the rates of ingestion (I) and egg production (B) were measured simultaneously at intervals of 6 h to 2 d for periods of 2-10 d. concentration, chemical composition (carbon and nitrogen), and species of phytoplankton were experimental variables. Egg production was related to the food ingested during the previous day. For one food type, I and B were rectilinear functions of P. The average maximum rates of ingestion and egg production were 1.1 μg N female $^{-1}d^{-1}$ and 53 eggs female $^{-1}d^{-1}$, equivalent to specific rates of 1.5 and 0.37 d^{-1}. B was proportional to I below a critical ingestion rate, I/sub c/, and independent of I above I/sub c/. For I<I/sub c/, the gross efficiency of egg production ($B.I^{-1}$) in terms of nitrogen was 0.37 while in terms of carbon it was a hyperbolic function of the ratio of C:N in the food, ranging between 0.41 (C:N/sub food/ = 4.0) and 0.15 (C:N/sub food/ = 11). For I>I/sub c/, $B.I^{-1}$ declined in terms of both carbon and nitrogen. These results, together with the ratio of C:N in particulate matter in the sea off southern California, suggest that nitrogen (hence protein) potentially limits egg production by adult female Paracalanus and that ingested carbon is used inefficiently.

32801 **Fluorescence: absorbance ratios: a molecular-weight tracer of dissolved organic matter.** Contract EY-76-S-02-1599-COO-1599-150. *Limnol. Oceanogr.;* **25**: No. 3, 559-564(May 1980).

Naturally occurring dissolved humic materials were fractionated according to molecular weight by dialysis and gel permeation chromatography. Components of higher molecular weight (>3,500) absorbed strongly at 250 nm but fluoresced weakly, while humic fractions of lower molecular weight fluoresced intensely per unit absorbance. With appropriate precautions, fluorescence: absorbance ratios may be useful in delineating seasonal and depth distribution patterns of dissolved humic materials of low and high molecular weight.

32802 **Modified neuston net for collecting live larval and juvenile fish.** Hettler, W.F. (National Marine Fisheries Service, Beaufort, NC). Contract E(49-7)-5. *Proc. Soc. Exp. Biol. Med.;* **41**: No. 1, 32-33(Jan 1979).

The construction and use of a modified neuston net is described. The net is intended for use in collecting larval and juvenile fish from a bridge platform in a tidal current. (ACR)

CHEMICALS MONITORING AND TRANSPORT

REFER ALSO TO CITATION(S) 31527, 32198, 32764, 32868, 32878

32803 (ANL/ES—98) **Costs and water quality effects of wastewater treatment plant centralization.** Macal, C.M.; Broomfield, B.J. (Argonne National Lab., IL (USA); Chicago Univ., IL (USA). Center for Urban Studies). Jan 1980. Contract W-31-109-ENG-38. 21p. NTIS, PC A02/MF A01.

The costs and water quality impacts of two regional configurations of municipal wastewater treatment plants in Northeastern Illinois are compared. In one configuration, several small treatment plants are consolidated into a smaller number of regional facilities. In the other, the smaller plants continue to operate. Costs for modifying the plants to obtain various levels of pollutant removal are estimated using a simulation model that considers the type of equipment existing at the plants and the costs of modifying that equipment to obtain a range of effluent levels for various pollutants. A dynamic water-quality/hydrology simulation model is used to determine the water quality effects of the various treatment technologies and

pollutant levels. Cost and water quality data are combined and the cost-effectiveness of the two treatment configurations is compared. The regionalized treatment-plant configuration is found to be the more cost-effective.

32804 (ANL/ES—99) **Costs and water quality effects of controlling point and nonpoint pollution sources.** Macal, C.M.; Broomfield, B.J. (Argonne National Lab., IL (USA); Chicago Univ., IL (USA). Center for Urban Studies). Jan 1980. Contract W-31-109-ENG-38. 24p. NTIS, PC A02/MF A01.

Costs and water quality effects of controlling point and nonpoint pollution sources are compared for the DuPage River basin in northern Illinois. Costs are estimated for effluent standards for municipal wastewater treatment plants and for the alternative, controlling runoff from nonpoint sources such as streets, agricultural lands, and forests. A dynamic water-quality/hydrology simulation model is used to determine water quality effects of various treatment plant standards and nonpoint-source controls. Costs and water quality data are combined, and the point-source and nonpoint-source plans are compared on a cost-effectiveness basis. Nonpoint-source controls are found to be more cost-effective than stricter control of pollutants from point sources.

32805 (FWS/OBS—80/30, pp 157-174) **Managing impacts of petroleum development in brackish marshes.** Longley, W.L. (General Land Office, Austin, TX); Jackson, R.G. May 1980.

From Gulf of Mexico coastal ecosystems workshop; Port Aransas, TX, USA (4 Sep 1979).

Petroleum development operations in wetlands are partitioned into seven phases and the activities are described for each phase. Environmental effects are discussed in terms of: vegetation and consumer losses; increases in dissolved, particulate, and toxic materials; and modifications of hydrology. Suggestions for minimization of impacts are presented. Changes in the water flow regimes of wetlands lead to the most significant alterations; thus, the land manager must concentrate his efforts on maintenance of these water flows during all petroleum development operations.

32806 (LA—8424-PR) **Water quality in the vicinity of Fenton Hill, 1979. Progress report.** Purtymun, W.D.; Ferenbaugh, R.W.; Stoker, A.K.; Adams, W.H. (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 24p. NTIS PC A02/MF A01.

Water quality data were collected from established surface and ground water stations and from ponds and pond discharges at the Fenton Hill Site located in the Jemez Mountains as part of a continuing program of environmental studies. There have been slight variations in the chemical quality of water from surface and ground water locations; however, these variations are within normal seasonal fluctuations. Water in the ponds is highly mineralized because of drilling operations and circulation tests at the site. Water quality in the ponds deteriorates further as it is reused. Most notable increases were in sulfates and total dissolved solids (TDS) in 1979. Discharge and overflow from the ponds infiltrates into the alluvium of the dry canyon within 300 m below the ponds. Monitoring of surface water and spring discharge downgradient from the ponds in the release area failed to detect any effects from release of water from the ponds. Analyses of water from the supply well at the site indicated metallic and nonmetallic ions were below the US Environmental Protection Agency (USEPA) and State of New Mexico standards or criteria for domestic or municipal uses.

32807 (ORNL/TM—6141) **Biogeochemistry of mercury in a river-reservoir system: impact of an inactive chloralkali plant on the Holston River-Cherokee Reservoir, Virginia and Tennessee.** Hildebrand, S.G.; Lindberg, S.E.; Turner, R.R.; Huckabee, J.W.; Strand, R.H.; Lund, J.R.; Andren, A.W. (Oak Ridge National Lab., TN (USA)). Aug 1980. Contract W-7405-ENG-26. 156p. NTIS, PC A08/MF A01.

Elevated mercury concentrations in fish species from the North Fork of the Holston River were observed in the early 1970's. The source of the mercury was a chloralkali plant which had ceased operation in 1972. Mercury continues to be released to the river from two large (~ 40-ha) waste disposal ponds at the plant site. This report presents results of a study of the emission of mercury to the environment from the abandoned waste ponds and of the distribution of mercury in water, sediment, and biota of the Holston River-Cherokee Reservoir System in Virginia and eastern Tennessee.

32808 (PNL-SA—7857) **Bioaccumulation and depuration of bromoform in five marine species.** Gibson, C.I.; Tone, F.C.; Schirmer, R.E.; Blaylock, J.W. (Battelle-Northwest, Sequim, WA (USA). Marine Research Lab.; Battelle Florida Marine Research Facility, Daytona Beach (USA); Battelle Pacific Northwest Labs., Richland, WA (USA)). Sep 1979. Contract AC06-76RL01830. 22p. (CONF-7910138—4). NTIS, PC A02/MF A01.

From 3. conference of chlorination: environmental impact and health effects; Colorado Springs, CO, USA (28 Oct 1979).

Bromoform has been identified as the major halogenated organic compound resulting from the chlorination of seawater. To test the potential for bioconcentration and subsequent return to man, 28-day uptake/28-day depuration studies were conducted with five commercially and recreationally important species (Protothaca staminea, Mercenaria mercenaria, Crassostrea virginica, Penaeus aztecus, Brevoortia tyrannus). The results indicate that for these species, the uptake and depuration is rapid (equilibrium is reached in 24 to 48 hours), and the concentration factors are relatively low (< 1 to 10 times the water concentration).

32809 **Role of volatilization in removing polycyclic aromatic hydrocarbons from aquatic environments.** Southworth, G.R. (Oak Ridge National Lab., TN). *Bull. Environ. Contam. Toxicol.;* **21**: No. 4/5, 507-514(Mar 1979).

The movement of organic contaminants from water to the atmosphere can be important in reducing concentrations of foreign substances in aquatic ecosystems. Polycyclic aromatic hydrocarbons (PAH), a class of chemical produced in the combustion and pyrolysis of organic fuels, possess properties which suggest that their volatility in solution may be significant. Since many PAH are potent carcinogens, a knowledge of their persistence, transport, and fate in aquatic environments is critical. The objective of this paper is to determine the relative volatility of two to five ring PAH structures in water, and estimate the importance of the volatilization process in removing PAH from aquatic environments.

32810 **Effect of wastewater treatment on methanogenesis in a marine outfall.** Warford, A.L.; Kosiur, D.R. (Univ. of California, Los Angeles). *J. Water Pollut. Control Fed.;* **51**: No. 1, 37-42(Jan 1979).

A study was undertaken to measure methanogenic recycling of outfall wastes and to determine the effect of wastewater treatment on methanogenesis in the Avalon outfall sediments of Santa Catalina Island, Calif. The study included the determination of in situ methane production in the outfall before and after wastewater treatment as well as the correlation of in situ methanogenic rates with those determined from laboratory incubations of outfall sediment.

RADIOACTIVE MATERIALS MONITORING AND TRANSPORT

REFER ALSO TO CITATION(S) 32771

32811 (LA—8400-PR) **Environmental and radiological safety studies: interaction of $^{238}PuO_2$ heat sources with terrestrial and aquatic environments. Progress report, January 1-March 31, 1980.** Waterbury, G.R. (comp.). (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 43p. NTIS, PC A03/MF A01.

The containers for $^{238}PuO_2$ heat sources in radioisotope thermoelectric generators are designed with large safety factors to ensure that they will withstand reentry from orbit and impact with the earth and safety contain the nuclear fuel until it is recovered. Existing designs have proved more than adequately safe, but the Office of the Assistant Director for Safety and Reliability of the Department of Energy Division of Advanced Systems and Materials Production continually seeks more information about the heat sources to improve their safety. The work discussed here includes studies of the effects on the heat source of terrestrial and aquatic environments to obtain data for design of even safer systems. The data obtained in several ongoing experiments are presented; these data tables will be updated quarterly. Discussions of experimental details are minimized and largely repetitive in succeeding reports. Compilations of usable data generated in each experiment are emphasized. These compilations include data from environmental chamber experiments that simulate terrestrial conditions, experiments to measure PuO_2 dissolution rates, soil column experiments to measure sorption of plutonium by soils, and several aquatic experiments.

WATER

REFER ALSO TO CITATION(S) 32786

32812 (SAND—79-1666) **Prediction of the migration of several radionuclides in ocean sediment with the computer code IONMIG: a preliminary report.** Russo, A.J. (Sandia National Labs., Albuquerque, NM (USA)). May 1980. Contract AC04-76DP00789. 23p. NTIS, PC A02/MF A01.

A computer code, IONMIG, which is used to calculate the far-field transport of radionuclides through ocean sediment by diffusion and convection is described. The code uses a two-dimensional, axisymmetric, explicit finite difference formulation. Preliminary results for several species (Cs, Pu, I, Tc) are given.

32813 **Evidence for plutonium(V) in an alkaline, freshwater pond.** Bondietti, E.A.; Trabalka, J.R. (Oak Ridge National Lab., TN

(USA)). *Radiochem. Radioanal. Lett.;* **42**: No. 3, 169-176(31 Jan 1980).

Soluble sup(239,240)Pu(V+VI) and Pu(III+IV) oxidation states were determined by a coprecipitation technique on filtered (<0.22 μm) water from a former radwaste final settling basin currently used for radioecological studies. Over a five month period, Pu(V+VI) species ranged in concentration from 3.1 to 9.6 dis/min/liter. Tetravalent Pu species ranged from 0.7 to 1.9 dis/min/liter. By evaluating the sorption behavior of the indigenous Pu(V+VI) and sup(233,234)U(VI) fraction in comparison to added Np(V), Pu(V), Pu(VI), and U(VI) isotopes, it was concluded that the dominant oxidation state of the soluble Pu(V+VI) fraction was Pu(V). This oxidation state has never been identified in an environmental matrix.

AQUATIC ECOSYSTEMS AND FOOD CHAINS

REFER ALSO TO CITATION(S) 31701, 32893

32814 (DOE/RL/02227—1) **Biogeochemical studies of technetium in marine and estuarine ecosystems. Progress report, 1 July 1979-30 June 1980.** Beasley, T.M. (Oregon State Univ., Newport (USA). Marine Science Center). 1980. Contract AT06-79EV10251. 43p. NTIS, PC A03/MF A01.

Progress is reported in research dealing with the biogeochemical behavior of technetium in marine and estuarine ecosystems. Studies were planned to elaborate the biokinetic behavior of Tc as TcO_4^- in selected marine and estuarine organisms and to determine the affinity of TcO_4^- for different marine sediments under oxygenated conditions. It is concluded that concentration factors for TcO_4^- in bivalve molluscs (oysters and mussels) do not exceed 2 when calculated for whole animals and when uptake is directly from water. Direct uptake from water by limpets (archeogastropod) are very much lower than have been reported for red abalone (archeogastropod). Whole body concentration factors for TcO_4^- in the plaice, Pleuronectes platessa, where uptake is directly from labeled seawater, do not exceed 10 at equilibrium. Both the lobster, Homarus gammaris and the polychaete, Nereis diversicolor appear to concentrate Tc efficiently from water labelled intially with TcO_4^-. Both plaice and rays (Raja clavata) fed /sup 95m/Tc labeled Nereis show an initial rapid loss of the isotope for approximately five days. Thereafter, loss is much reduced. Shrimp (Palaemon elegans), Crangnon sp.) and Crab (Cancer pagurus) show concentration factors similar to plaice (C.F. is less than 10). Isopods, however, have concentration factors of only 3 following four weeks exposure to labeled seawater. Uptake of TcO_4^- by phytoplankton is extremely low, which precludes experiments in which TcO_4^- labeled phytoplankton can be fed to either bivalve molluscs or microzooplankton. Sediment distribution coefficients for TcO_4^- are essentially zero and are independent of sediment type in well oxygenated seawater. Experiments to date have shown that it is not possible to make generalizations concerning the bioavailability of TcO_4^- to marine organisms.

32815 (ORO—3852-36) **Plutonium in the Gulf of Mexico.** Scott, M.R.; Salter, P.F. (Texas A and M Univ., College Station (USA). Research Foundation). [nd]. Contract AS05-76EV03852. 36p. NTIS, PC A03/MF A01.

The geochemistry of fallout plutonium in the sediments of the Gulf of Mexico was studied. A series of sediment cores was collected in a traverse from the deep Gulf of Mexico to the Mississippi Delta. The cores were sliced into 1 cm intervals and analyzed for plutonium. Explanations for the variations in concentration are presented. (ACR)

32816 (ORO—3852-37) **Uranium and thorium series nuclides in river sediments and river water.** Scott, M.R.; Salter, P.F. (Texas A and M Univ., College Station (USA). Research Foundation). [nd]. Contract AS05-76EV03852. 27p. NTIS, PC A03/MF A01.

Large volume suspended sediment samples were taken from Rio Grande, Mississippi and Suwannee Rivers. These rivers drain arid, moderate and subtropical regions, respectively. The samples were taken to provide enough material to use for chemical fractionation leaching studies of the relationship between Pu and other nuclides with various components of the sediment. This work is still in progress and is described in detail in a separate section of the progress report.

32817 (ORO—3852-38) **Uranium and thorium series isotopes in nearshore marine sediments.** Scott, M.R.; Salter, P.F. (Texas A and M Univ., College Station (USA). Research Foundation). [nd]. Contract AS05-76EV03852. 11p. NTIS, PC A02/MF A01.

Measurements of U and Th series isotopes have been made on sediments most often as a means of estimating sediment accumulation rates. Therefore data are available for long half-life isotopes such as ^{230}Th and ^{231}Pa on slowly depositing deep-sea sediments, and for the short half-life isotopes such as ^{228}Th, ^{234}Th, and ^{210}Pb mostly on rapidly accumulating coastal sediment. Studies of U and Th series nuclides in sediments of rivers entering the Gulf have been described in a previous section of this progress report. The isotopic decay series are out of equilibrium at several steps in the series. The activity ratio of $^{234}U/^{238}U$ is greater than 1 in sediment and water samples in a few cases, and the $^{230}Th/^{234}U$ ratio is greater than 1 in most instances. In the case of the Mississippi River suspended sediment, an average of 0.93 dpm/gm ^{230}Th is present in excess of the amount of its parent ^{234}U. This excess ^{230}Th clearly must be added to the Gulf of Mexico by the river. The Gulf of Mexico sediments have been reported to have unusually high U concentrations. We have therefore begun a study of U, Th, Pa, Ra, and Pb isotopes in the sediments of this system, including the nearshore marine area of the Mississippi River Delta. The preliminary results are discussed in this report.

THERMAL EFFLUENTS MONITORING AND TRANSPORT

REFER ALSO TO CITATION(S) 32188

SITE RESOURCE AND USE STUDIES

REFER ALSO TO CITATION(S) 31622, 31624, 31627, 31703, 31874

REGULATIONS

REFER ALSO TO CITATION(S) 32495, 32788

32818 (FWS/OBS—80/30, pp 175-184) **State-Federal relations in the coastal zone.** Dedmon, J. (Fish and Wildlife Service, Atlanta, GA). May 1980.

From Gulf of Mexico coastal ecosystems workshop; Port Aransas, TX, USA (4 Sep 1979).

The coastal zone has become the focal point of the most bitter conflicts being waged between Federal and State agencies. Until the issues of control over and responsibility for coastal resources have been settled, the conflict will continue. The comparative newness of many programs has resulted in uncertainty over which governmental unit will be responsible for which function. A major effort to clarify these matters will take place in the courts, and it is vital that those involved know what the issues are and how they may be resolved. Many times, the laws which have been enacted are allowed to hinder rather than help accomplish a goal, but better understanding of laws and their implementation would improve the situation. There are certain statutes and regulations which affect every project undertaken and should be given particular attention. Current developments in laws which affect US Fish and Wildlife Service (FWS) efforts and efficiency in the coastal zone are summarized.

32819 (FWS/OBS—80/30, pp 185-189) **Adaptive environmental assessment and management: an overview.** Cordes, C.L. (Fish and Wildlife Service, Slidell, LA). May 1980.

From Gulf of Mexico coastal ecosystems workshop; Port Aransas, TX, USA (4 Sep 1979).

Coastal resource managers and others concerned with protecting fish and wildlife and their habitats are primarily involved in the environmental assessment process in a reactive review role. What often results are confrontations among representatives of various interest groups, most of whom had no opportunity to participate in the original project design. Subsequent attempts to modify a project are almost always strongly opposed, and conflict resolution is rarely achieved. Thus, many projects offering legitimate social benefits are delayed and unique opportunities for enhancing natural resources are lost. These problems largely result because contemporary methods for evaluating effects of planned projects or management policies on environmental resources are inappropriate. It is clear that new approaches must be developed and implemented if environmental amenities and values are to appropriately be considered in public decisions. One such approach is that of adaptive environment assessment and management described by Holling (1978), and summarized here. The methodologies of adaptive environmental assessment and management insure that environmental dimensions are integrated as equal elements with economic and social considerations at the very beginning of the development or management design process. Alternative management policies and development plans are generated in an atmosphere of open communication between developers and resource managers and each alternative is collectively assessed for its environmental, economic, and social consequences. Flexibility is encouraged in project designs and management strategies so they may be adapted to unexpected ecological events and adjusted to benefit from information feedback throughout the development process.

ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES

SOCIAL AND ECONOMIC STUDIES

REFER ALSO TO CITATION(S) 32391

ASSESSMENT OF ENERGY TECHNOLOGIES

32820 (DOE/EV—0072) **Technology Characterizations. Environmental Information Handbook.** (Department of Energy, Washington, DC (USA). Div. of Technology Assessments). Jun 1980. 285p. NTIS, PC A13/MF A01.

The Environmental Handbook Series is designed to overcome the deficiency of information utility and transfer. Each of the works in this series brings together information in an area and format that is useful to both public and private sector needs. It is meant to serve as a basic reference document that will stand for a period of time and help to enrich decisionmaking and research in the interface of energy and the environment. This particular handbook deals with environmental characterization data for the energy technologies and presents the data in a format for use by DOE policy analysts. This treatment includes not only the actual information base, but also a preface which explains the present concept, the historical growth of the program, and the new direction for improved utility. The information base, itself, is constantly being enhanced and is republished periodically as necessary. The specific energy systems for which environmental/technology characterization information is provided are grouped as follows: nuclear energy; coal; petroleum; gas; synthetic fuels; solar energy; geothermal energy; and hydroelectricity.

ENVIRONMENTAL IMPACT STATEMENTS

REFER ALSO TO CITATION(S) 31532, 31533, 31534

32821 **Final environmental impact statement. Nebraska public power district: 329 miles of 345-KV transmission facilities.** Washington, DC; Department of Agriculture (1979). vp. (USDA-REA-EIS(ADM)—78-10-F). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC (MF or HC) 79-0332.

Construction is proposed of 329 miles of 345-kilovolt transmission line in the counties of Cheyenne, Deuel, Keith, Lincoln, Custer, Sherman, Buffalo, Frontier, and Red Willow, Nebraska. The facilities would interconnect the new Keystone, Sweetwater, and Red Willow substations to the existing Sidney and Riverdale substations and the Gerald Gentleman staton. The transmission line generally would comprise four-legged, self-supporting steel lattice towers, with a typical span between towers of 1320 feet. Minimum clearance between ground level and conductors would be 30.5 feet, and right-of-way width would be 200 feet. New substation facilities would be of low profile design and ring bus configuration.

32822 **Final environmental impact statement. Lake City to Creede 115-kV transmission line: Poncha to San Luis Valley 230-kV transmission line.** Washington, DC; Department of Agriculture (1979). vp. (USDA-REA-EIS(ADM)—78-8-F). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) 79-0550.

Construction of 65 miles of 230-kilovolt (kV) transmission line in the Poncha-San Luis Valley study area of Colorado is proposed as an alternative to an originally planned 44-mile, 115-kV line between Lake City (Hinsdale County) and Creede (Mineral County). Construction of the original preferred facility would be delayed until study is completed of potential wilderness areas that the line would traverse. The proposed alternative transmission line would extend from the new Poncha substation near Poncha Springs (Chaffee County) to a new San Luis valley substation near Center (Alamosa County). Both the preferred and the proposed alternative transmission lines would use wood pole, H-frame construction and nonspecular conductors. The existing Creede substation would be exanded to accommodate a new 115/69-kV facility.

32823 **Final environmental impact statement. Antelope Valley Station: two 455-MW units and related transmission facilities.** Washington, DC; Department of Agriculture (1978). vp. (USDA-REA-EIS(ADM)—77-6-F). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 78-0818.

The Basin Electric Power Cooperative proposes the construction of two 455-megawatt (MW) lignite-fired, steam-electric-generatig units at its Antelope Valley Station in Mercer County, North Dakota. In addition, construction is planned of two 26-mile, 345-kilovolt (kV) transmission lines and a 275-mile, 500-kV transmission line. The 500-kV transmission line would traverse Mercer, Oliver, Morton, and Emmons counties in North Dakota and Campbell, Wallworth, Edmunds, Potter, Faulk, Spink, Hand, and Beadle counties in South Dakota. Makeup water for the Antelope Valley Plant would be pumped through a pipeline from Lake Sakakawea, and the primary fuel would originate at newly developed lignite mines nearby. The plant would include particulate and sulfur dioxide removal equipment and mechanical draft cooling towers for condenser water cooling. Use of the lignite mine, site development, water intake, and steam would be coordinated with a planned gasification project by the American Natural Gas Company (ANG).

32824 **Final environmental impact statement. Thomas Hill 610-MW unit 3, icluding mine expansion and related transmission facilities.** Washington, DC; Department of Agriculture (1978). vp. (USDA-REA-EIS(ADM)—78-2-F). Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 78-0936.

Addition of a third steam-electric-generating unit to the Thomas Hill Plant in Randolph County, Missouri is proposed. The new coal-fired unit would have a net base-load capacity of 610 megawatts. Coal would be surface mined at the nearby Prairie Hill Mine, and a new coal preparation plant would be constructed nearby. Unit 3 would be equipped with an electrostatic precipitator and throwaway sulfur dioxide scrubbers. Cooling water for the once-through system would come from the existing 4,500-acre Thomas Hill Reservoir. The existing discharge channel would be extended to dissipate waste heat over a larger portion of the reservoir surface area. A 345-kilovolt (kV) transmission line would extend for approximately 60 miles southeasterly to a 345/161-kV substation and then about 75 miles southerly to another substation. The transmission line route would have a right-of-way width of 150 feet. Construction would begin in June 1978 and start-up of the unit would be in September 1981.

BIOMEDICAL SCIENCES, BASIC STUDIES

REFER ALSO TO CITATION(S) 32775

BEHAVIORAL BIOLOGY

REFER ALSO TO CITATION(S) 32852, 32853

32825 (CONF-7904140—1) **State of the art and needs of the earth platform.** Kuechle, L.B.; DeMaster, D.P.; Siniff, D.B. (Minnesota Univ., Minneapolis (USA)). 1979. Contract AS02-76EV01332. 16p. NTIS, PC A02/MF A01.

From 13. international symposium on remote sensing of environment; Ann Arbor, MI, USA (23 Apr 1979).

This paper outlines the current state of th art in designing the animal platform segment for use in satellite location systems. It also discusses some areas where compromises may be possible allowing use in a wider range of applications. Problems with batteries, antenna design and oscillator stability are discussed.

BIOCHEMISTRY

REFER ALSO TO CITATION(S) 31847, 31853, 32801, 32840, 32851

32826 (DOE/ET/04967—2) **Gene-enzyme telationships in somatic cells and their organismal derivatives in higher plants. Progress report.** Jensen, R.A. (State Univ. of New York, Stony Brook (USA). Research Foundation). 21 Apr 1980. Contract AS02-78ER04967. 3p. NTIS, PC A02/MF A01.

Progress is reported in the following subject areas: (1) chemistry of the arogenate molecule; (2) plant enzymology at the organismal level; (3) isolation of regulatory mutants in tobacco; and (4) stability of the haploid state in Nicotiana sylvestris.

32827 (LA-UR—80-1904) **Automation of the enzyme immunoassay for the serodiagnosis of infectious diseases in cattle.** Seawright, G.L.; Sanders, W.M.; Bryson, M. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 33p. (CONF-800754—1). NTIS, PC A03/MF A01.

From International symposium on the ruminant immune system; Plymouth, NH, USA (7 Jul 1980).

The enzyme immunoassay (EIA) is a versatile and highly sensitive new tool that can be used to detect a wide variety of infectious diseases or toxic agents and other low molecular weight

compound. The paper describes the present state of development of the EIA-modified Technicon Autoanalyzer II instrumentation, standardization of quality control criteria for the automated EIA and standardization of the diagnostic decision process. (ACR)

32828 Amino-terminal sequence of adenovirus type 2 proteins: hexon, fiber, component IX, and early protein 1B-15K. Anderson, C.W.; Lewis, J.B. (Brookhaven National Lab., Upon, NY). *Virology;* **104**: No. 1, 27-41(15 Jul 1980).

The partial amino-terminal amino acid sequence was determined for four adenovirus 2 proteins: hexon, fiber, component IX, and early protein E1B-15K. A comparison of these sequences with the nucleotide sequences of the region of the genome encoding each of these proteins has identified the initiation sites for protein synthesis. Each protein is initiated at the AUG codon nearest the 5' end of its mRNA. The initiating methionine is retained by fiber and component IX while it is removed from hexon and protein E1B-15K.

32829 Very-high-resolution two-dimensional gel electrophoresis of proteins using giant gels. Voris, B.P.; Young, D.A. (Univ. of Rochester School of Medicine and Dentistry, NY). *Anal. Biochem.;* **104**: No. 2, 478-484(15 May 1980).

An improved high-resolution two-dimensional gel system for separating complex protein mixtures is described that allows a three-fold increase in the number of proteins detected. LIke the original 0'Farrell system, proteins are separated in the first dimension by isoelectric point and in the second dimension by size. The improved resolution results primarily from a 2.5-fold increase in the size of both dimensions. Although best resolution is obtained by application of <100 μg of protein containing $>5 \times 10^6$ cpm, as much as 150 μg of protein may be applied without appreciable loss of resolution. Useful separations may be made with up to 1.5 mg. By doubling the thickness of both dimensions, as much as 3 mg of protein can be separated into 300 to 400 separate peaks.

32830 Biological activities of indoleacetylamino acids and their use as auxins in tissue culture. Hangarter, R.P.; Peterson, M.D.; Good, N.E. (Michigan State Univ., East Lansing). Contract EY-76-S-02-2528M005. *Plant Physiol.;* **65**: No. 5, 761-767(May 1980).

The auxin activities of a number of indoleacetylamino acid conjugates have been determined in three test systems: growth of tomato hypocotyl explants (Lycopersicon esculentum Mill. cv. Marglobe); growth of tobacco callus cultures (Nicotiana tabacum L. cv. Wisconsin 38); and ethylene production from pea stems (Pisum sativum L. cv. Alaska). The activities of the conjugates differ greatly depending on the amino acid moiety. Indoleacetyl-L-alanine supports rapid callus growth from the tomato hypocotyls while inhibiting growth of shoots and roots. Indoleacetlyglycine behaves in a similar manner but is somewhat less effective in supporting callus growth and in inhibiting growth of shoots and roots. Indoleacetylglycine behaves in a similar manner but is somewhat less effective in supporting callus growth and in inhibiting shoot formation. The other amino acid conjugates tested (valine, leucine, aspartic acid, threonine, methionine, phenylalanine, and proline) support shoot formation without supporting root formation or much callus growth. The tobacco callus system, which forms abundant shoots in the presence or absence of free indoleacetic acid, produces only rapid undifferentiated growth in the presence of indoleacetyl-L-alanine and indoleacetylglycine. The other conjugates inhibit shoot formatin weakly if at all. Most of the conjugates induce sustained ethylene production from the pea stems but at rates well below the initial rates observed with free indoleacetic acid. Many, but not all of the effects of conjugates such as indoleacetyl-L-alanine can be mimicked by frequent renewals of the supply of free indoleacetic acid.

32831 Slow adaptive changes in urease levels of tobacco cells cultured on urea and other nitrogen sources. Skokut, T.A.; Filner, P. (Michigan State Univ., East Lansing). *Plant Physiol.;* **65**: No. 5, 995-1003(May 1980).

Tobacco (ev. Xanthi) XD cells cultured for more than a year on urea as the sole source of nitrogen have urease activities about four times higher than cells which have been cultured on nitrate. When cells which had always been grown on nitrate were transferred to urea, the urease activity in these cells remained at a lower level for eight transfers (40 generations), then gradually increased 4-fold during the next seven to 10 transfers. Cells with high urease activity multiplied 19% more rapidly and accumulated less urea than cells with low urease activity. These findings suggest that elevated urease accelerates urea assimilation; therefore, urea limited growth. It is suggested that the molecular basis of the urease increase may be gene amplification, based on animal cell models. An alternative hypothesis, namely a specific response induced in all cells by urea and manifested as a very slow adaptive increase in urease, has not been ruled out.

32832 Erythropoietic stress, macrocytosis, and hemoglobin switching in HbAA sheep. Mohandas, N.; Clark, M.R.; Wyatt, J.L.; Garcia, J.F.; Eisenberg, P.D.; Shohet, S.B. (Univ. of California, San Francisco). *Blood;* **55**: No. 5, 757-761(May 1980).

Hemoglobin switching and macrocytosis were studied in homozygous hemoglobin AA sheep. An abrupt initiation of erythropoietic stress, accompanied by a pulsed elevation of circulating erythropoietin levels, was induced by phlebotomy. Sequential blood samples were separated according to density on Stractan gradients to isolate cells newly entering the circulation from the marrow each day. Analysis of hemoglobin phenotype and cell volume distribution in these young reticulocytes revealed a distinct temporal separation in the appearance of hemoglobin C and increased cell volume. The appearance of macrocytes within 24 h of erythropoietin elevation suggests that macrocytosis could be the result of the action of erythropoietin during the late stages of erythroid maturation. The 72-h delay in the appearance of hemoglobin C indicates that commitment to a particular hemoglobin phenotype occurs at an early stage of differentiation and involves immature erythroid stem cells. The results of this study show that these consequences of erythropoietic stress are initiated at two different developmental stages, resulting in the production of macrocytosis and hemoglobin switching.

TRACER TECHNIQUES

REFER ALSO TO CITATION(S) 32856

CYTOLOGY

REFER ALSO TO CITATION(S) 32830

32833 Preparation of separate astroglial and oligodendroglial cell cultures from rat cerebral tissue. McCarthy, K.D.; de Vellis, *J. J. Cell Biol.;* **85**: No. 3, 890-902(Jun 1980).

A novel method has been developed for the preparation of nearly pure separate cultures of astrocytes and oligodendrocytes. The method is based on (a) the absence of viable neurons in cultures prepared from postnatal rat cerebra, (b) the stratification of astrocytes and oligodendrocytes in culture, and (c) the selective detachment of the overlying oligodendrocytes when exposed to sheer forces generated by shaking the cultures on an orbital shaker for 15 to 18 h at 37°C. Preparations appear >98% pure and contain ~1-2 x 10^7 viable cells (20 to 40 mg of cell protein). Three methods were used to characterize these two culture types. First, electron microscopic examination was used to identify the cells in each preparation (mixed and separated cultures of astrocytes and oligodendrocytes) and to assess the purity of each preparation. Second, two oligodendroglial cell markets, 2',3' -cycle nucleotide 3' -phosphohydrolase (EC 3.1.4.37) and glycerol phosphate dehydrogenase (EC 1.1.1.8) were monitored. Third, the regulation of cyclic AMP accumulation in each culture type was examined. In addition to these studies, we examined the influence of brain extract and dibutyryl cAMP on the gross morphology and ultrasturcture of each preparation. These agents induced astroglial process formation without any apparent morphological effect on oligodendrocytes. Collectively, the results indicate that essentially pure cultures of astrocytes and of oligodendrocytes can be prepared and maintained. These preparations should significantly aid in efforts to examine the biochemistry, physiology, and pharmacology of these two major classes of central nervous system cells.

32834 Collaborative research on photoelectron microscopy of chloroplast membranes. Final report. Massey, G.A. Washington, DC; National Science Foundation (1980). 9p. (NP—25008).

A variety of far ultraviolet laser sources for photoelectron microscopy of chloroplast membranes have been developed, and the physical difficulties of using such bright sources in the microscope have been investigated experimentally and theoretically. Nonlinear converters have been used to shift radiation from several types of infrared Nd:YAG lasers and dye lasers into the 208-230 nm ultraviolet spectrum. Conversion of dye laser radiation provided continuous tuning. The most successful nonlinear optical source was the neodymium fifth harmonic at 213 nm. A rare gas pulsed ion laser operable at 5 wavelengths between 195 nm and 225 nm was also developed, and in addition we have demonstrated a silver ion vapor laser operating continuously at 224 nm with one milliwatt output. With pulsed lasers one may encounter problems of space charge aberrations in the microscope, and even sample thermal damage, if the peak power is too high. A theory treating these effects has been developed, and the effects have been observed. Resolutions below 1000 A have been obtained to date with 213 nm radiation in a pulsed format. Using the newly developed Ag^+ laser much better results should be obtainable.

TRACER TECHNIQUES

32835 (ORO—2832-212) Size and number of DNA molecules from Chinese hamster ovary cells determined by molecular autoradio-

graphy. Todd, M.B. (Texas Univ., Houston (USA)). Jun 1980. Contract AS05-76EV02832. 41p. NTIS, PC A03/MF A01.

Thesis.

A new method for visualization of separable subunits of DNA is described. Autoradiography of tritium-labeled DNA from one or a few nuclei, lysed with detergent, moderate salt, and proteases, and gently deposited on a filter, allows determination of subunit molecular weight, size distribution, number per nucleus, and organization. The shape of the size distribution of CHO subunit images is similar to that of CHO mitotic chromosomes, and the numbers of subunits per nucleus supports a model of eight subunits per chromosome.

32836 (ORO—2832-213) **Radiation and biophysical studies on cells and viruses. Progress report, September 1, 1979-June 15, 1980.** (Texas Univ., Houston (USA). System Cancer Center). 1980. Contract AS05-76EV02832. 95p. NTIS, PC A05/MF A01.

Research progress for the year 1979-1980 is reported for projects in damage and repair of genetic structures, and organization of genetic structures. (ACR)

GENETICS

REFER ALSO TO CITATION(S) 32826, 32828

32837 (SLAC-PUB—2462) **Combinatorial hierarchy: an approach to open evolution.** Noyes, P. (Stanford Linear Accelerator Center, CA (USA)). Jan 1980. Contract AC03-76SF00515. 24p. (CONF-800111—3). NTIS, PC A02/MF A01.

From Annual conference of the American Association for the Advancement of Science; San Francisco, CA, USA (4 Jan 1980).

A unified scientific philosophy based on evolutionary principles which can provide a framework within which physical, cosmological, biological, and cultural evolution are described in the same terms could help meet the planetary crisis we face. The combinatorial hierarchy approach to basic discrete and sequential physical processes, which incorporates the essential evolutionary features of conserved information and selection in the presence of a random, novelty-producing background is proposed as a candidate for this framework, and briefly explained. Recent work shows that many aspects of particle physics and cosmology can be systematically understood in this way. A normative principle, based on the derived fact of a fixed past and uncertain future characterized by responsible moral choice is proposed as consistent with - but not derivable from - this philosophy.

METABOLISM

TRACER TECHNIQUES

32838 (UCLA—12-1259) **Emission computed tomography of ^{18}F-fluorodeoxyglucose and ^{13}N-ammonia in stroke and epilepsy.** Kuhl, D.E.; Phelps, M.E.; Engel, J. Jr. (California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology). 1980. Contract AC03-76SF00012. 14p. (CONF-800937—1). NTIS, PC A02/MF A01.

From International symposium on medical radionuclide imaging; Heidelburg, F.R. Germany (1 Sep 1980).

The ECAT Positron Tomograph was used to scan normal control subjects, stroke patients at various times during recovery, and patients with partial epilepsy during EEG monitoring. ^{18}F-fluorodeoxyglucose (^{18}FDG) and ^{13}N-Ammonia ($^{13}NH_3$) were used as indicators of abnormalities in local cerebral glucose utilization (LCMR/sub glc/) and relative perfusion, respectively. Hypometabolism, due to deactivation or minimal damage, was demonstrated with the ^{18}FDG scan in deep structures and broad zones of cerebral cortex which appeared normal on x-ray CT (XCT) and /sup 99m/Tc pertechnetate scans. In patients with partial epilepsy, who had unilateral or focal electrical abnormalities, interictal ^{18}FDG scan patterns clearly showed localized regions of decreased (20 to 50%) LCMR/sub glc/, which correlated anatomically with the eventual EEG localization.

MEDICINE

32839 **Cyclophosphamide, vincristine, methotrexate with leucovorin rescue, and cytarabine (COMLA) combination sequential chemotherapy for advanced diffuse histiocytic lymphoma.** Sweet, D.L.; Golomb, H.M.; Ultmann, J.E. (Univ. of Chicago, IL). *Ann. Intern. Med.;* **92**: No. 6, 785-790(Jun 1980).

A program of combination sequential chemotherapy using cyclophosphamide, vincristine, methotrexate with leucovorin rescue, and cytarabine (COMLA) was administered to 42 previously untreated patients with advanced diffuse histiocytic lymphoma. Twenty-three patients achieved a complete remission as determined by strict clinical restaging criteria. The observed median duration of survival for the complete responders is longer than 33 months. Eight patients achieved a partial response, with a median survival longer than 21 months. Eleven patients showed no response, with a median survival of 5 months. Toxicity was acceptable. None of the responders have shown central nervous system relapse. There was no difference in response rates between patients with stage III or IV lymphoma or between asymptomatic or symptomatic patients. The COMLA program produces a high rate of complete and durable remissions and should be considered as an initial form of management of patients with advanced diffuse histiocytic lymphoma.

32840 **Elevation of serum acid phosphatase in cancers with bone metastasis.** Tavassoli, M. (Scripps Clinic and Research Foundation, La Jolla, CA); Rizo, M.; Yam, L.T. Contract EP-78-S-03-0899. *Cancer;* **45**: No. 9, 2400-2403(1 May 1980).

In patients with nonprostatic cancer, serum acid phosphatase activity is usually elevated when bone metastasis is present but not when bone metastasis is absent. The fraction responsible for serum enzyme elevation is a normal component of serum; it appears in gel electrophoresis as band 5; and is tartrate-resistant. It is suggested that the origin of acid phosphatase elevation is bone osteoclasts rather than cancer tissue, as is the case with prostatic carcinoma. Determination of serum acid phosphatase activity may be useful in the detection of bone metastasis.

UNSEALED RADIONUCLIDES IN DIAGNOSTICS

REFER ALSO TO CITATION(S) 32866, 32867

32841 (TID—3319-S8-P1) **Nuclear medicine: a bibliography.** (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Sep 1978. 677p. NTIS, PC A99/MF A01.

References to 6208 publications related to nuclear medicine that have been added to the Department of Energy's information data base since July 1976 are contained in this bibliography. Documents dealing with therapeutic irradiation are included in the data base only if there is new information on the technique, if there is significant information on the effects on normal tissues, if evaluations are made of new radiation sources, e.g., pion beams, or if dose or dose distribution measurements are made. Information on uses of isotope tracers in medicine is included if a contribution is made to the technology of tracer usage. References to instrumentation used in nuclear medicine, such as that for detection of radiation or measurement of doses, are included. Extensive bibliographies or reviews are also included.

32842 (TID—3319-S8-P2) **Nuclear medicine: a bibliography.** (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Sep 1978. 665p. NTIS, PC A99/MF A01.

References to 6208 publications related to nuclear medicine that have been added to the Department of Energy's information data base since July 1976 are contained in this bibliography. Documents dealing with therapeutic irradiation are included in the data base only if there is new information on the technique, if there is significant information on the effects on normal tissues, if evaluations are made of new radiation sources, e.g., pion beams, or if dose of dose distribution measurements are made. Information on uses of isotope tracers in medicine is included if a contribution is made to the technology of tracer usage. References to instrumentation used in nuclear medicine, such as that for detection of radiation or measurement of doses, are included. Extensive bibliographies or reviews are also included.

32843 **Physical attributes of single-photon tomography.** Budinger, T.F. (Lawrence Berkeley Lab., CA). *J. Nucl. Med.;* **21**: No. 6, 579-592(Jun 1980).

From 27. annual meeting of the Soceity of Nuclear Medicine; Detroit, MI, USA (24 Jun 1980).

Physical properties important for assessment of the potentials of emission computed tomography implemented by collimated detector systems include sensitivity, statistical and angular sampling requirements, attenuation compensation, resolution uniformity, and multisection design constraints. The limited angular range and sampling interval of coded aperture methods for longitudinal tomography impose severe limitations on quantitative imaging capabilities. These methods are discussed. Disadvantages of limited angular range are avoided by transverse section devices that have lower sensitivity than comparable positron devices. It is shown here, however, that the sensitivity for a single section device for head transverse section 2 cm thick can be 200 events sec^{-1} μCi^{-1} per axial cm for 2 x 2 cm resolution. This is 40% of that for a well-designed positron system of similar resolution. The problem of attenuation compensation for constant attenuation, as in brain imaging, is well understood and a fast algorithm of the convolution type gives excellent results if angular sampling is over 360°. Though there is a need to move the single-photon detector array over wide angular

distances for adequate sampling, dynamic ECT is possible for the measurement of biological washout kinetics of clinical importance, such as clearance studies in brain. Based on physical principles, experiences with low sensitivity devices, and the prospects for devices with sensitivity comparable to positron tomographs, single photon tomography has sound potentials for research and clinical studies of the adult brain and whole body in small subjects. Practical whole-body tomography in adults is limited to nonquantitative lesion detection.

32844 Radiation dosimetry of two new tellurium-123m-labeled adrenal-imaging agents: concise communication. Woo, D.V.; Knapp, F.F. Jr.; Ambrose, K.R.; Callahan, A.P.; Coffey, J.L. (Oak Ridge National Lab., TN). *J. Nucl. Med.;* **21**: No. 5, 454-458(May 1980).

The absorbed radiation doses to humans from 23-(isopropyl[/sup 123m/Te]telluro)-24-nor-5α-cholan-3 β-ol (Te-123m-23-ITC) and 24-(isopropyl[/sup 123m/Te]telluro)-chol-5-en-3β-ol (Te-123m-24-ITC) have been calculated, based on rat biological data, to assess the relative radiation risks to humans from these two new adrenal-imaging agents. The estimated radiation doses to several critical organs have been compared with dose estimates for a variety of other radiolabeled steroids that have been designed as adrenal-imaging agents. Dose estimates to selected organs from Te-123m-23-ITC are as follows (rad/mCi): adrenals 98; ovaries 8.0; liver 1.6. Similar estimated values for Te-123m-24-ITC are: adrenals 210; ovaries 13; liver 2.0. The radiation dose estimates for these two agents are comparable to the calculated radiation doses from 6β-[(methyl[^{75}Se]seleno)methyl]-19-nor-cholest-5(10)-en-3β-ol (Scintidren) and 19-[^{131}I]iodocholest-5-en-3β-ol (NP-59), two agents currently in clinical use for the diagnosis of adrenal disease.

32845 /sup 99m/Tc-methylene diphosphonate bone imaging in the evaluation of total hip prostheses. Weiss, P.E.; Mall, J.C.; Hoffer, P.B.; Murray, W.R.; Rodrigo, J.J.; Genant, H.K. *Radiology;* **133**: No. 3, 727-730(Dec 1979).

A retrospective study was performed to determine the accuracy of /sup 99m/Tc-methylene diphosphonate bone imaging in the evaluation of total hip arthroplasty for loosening and/or infection. Using focally increased activity at the tip of the femoral component or in the region of the acetabular component as a criterion, the examination was 77% specific and 100% sensitive for loosening and/or infection. A possible explanation for the increased uptake at the tip of the femoral component and the role of this examination in the management of a painful total hip prosthesis are discussed.

32846 Evaluation of hepatobiliary imaging by radionuclide scintigraphy, ultrasonography, and contrast cholangiography. Cheng, T.H.; Davis, M.A.; Seltzer, S.E.; Jones, B.; Abbruzzese, A.A.; Finberg, H.J.; Drum, D.E. Contract EY-76-S-4115. *Radiology;* **133**: No. 3, 761-767(Dec 1979).

Cholescintigraphy, ultrasonography, and contrast cholangiography were compared in 60 patients. Among those having abdominal pain but no biliary disease or jaundice, cholescintigraphy was normal in 14/14, ultrasound in 10/13, and cholangiography in 13/14. Jaundice due to hepatocellular disease was correctly distinguished from complete biliary obstruction by cholescintigraphy in 17/17 patients and by ultrasound in 14/17. In cholelithiasis, ultrasound was abnormal in 10/12 and cholangiography in 7/9. Cholescintigraphy appeared most sensitive to active cholecystitis; only cholangiography and ultrasound visualized gallstones.

32847 Myocardial positron tomography with manganese-52m. Atkins, H.L. (Brookhaven National Lab., Upton, NY); Som, P.; Fairchild, R.G.; Hui, J.; Schachner, E.; Goldman, A.; Ku, T. Contract EV-76-C-02-0016. *Radiology;* **133**: No. 3, 769-774(Dec 1979).

The biodistribution of radiomanganese (^{54}Mn) was studied in mice, rats, and dogs. Disappearance of radioactivity from the blood was extremely rapid, with a half-time of approximately 0.8 minutes. This resulted in very favorable myocardium-to-blood ratios, even at early times after administration. The myocardial uptake in dogs was greater than 3% at three and 15 minutes, with myocardium-to-blood ratios of about 40:1 at 15 minutes. Positron tomograms obtained with /sup 52m/Mn clearly demonstrated regional myocardial perfusion. There was good correlation (r = 0.89) of microsphere-to-radiomanganese distribution in the infarcted dog heart.

EXTERNAL RADIATION IN DIAGNOSTICS

REFER ALSO TO CITATION(S) 32841, 32842, 33056

32848 Proton imaging for medical applications. Kramer, S.L.; Moffett, D.R.; Martin, R.L.; Colton, E.P.; Steward, V.W. (Argonne National Lab., IL). *Radiology;* **135**: No. 2, 485-494(May 1980).

From 66. scientific assembly and annual meeting; Dallas, TX, USA (16 Nov 1980).

In order to demonstrate the potential advantages of proton imaging for medical use, a 205-MeV proton beam was developed using the Argonne National Laboratory Booster I synchrotron. Data were taken using a narrow scanning beam and an electronic detector system. The proton images were compared to conventional radiographs, and demonstrate a significant dose reduction and an improved mass resolution over the radiographs. The images also show significant differences in the proton stopping power of different tissues, thus demonstrating considerable potential in soft-tissue imaging. The development of a proton tomographic scan system is also briefly discussed.

EXTERNAL RADIATION IN THERAPY

REFER ALSO TO CITATION(S) 32841, 32842

UNSEALED RADIONUCLIDES IN THERAPY

REFER ALSO TO CITATION(S) 32841, 32842

32849 Technique for rapid implantation of multiple iodine-125 seeds. Doss, J.D.; Albillar, J.I. (Los Alamos Scientific Lab., NM). *Radiology;* **134**: No. 1, 258-260(Jan 1980).

A simple and convenient technique for the permanent implantation of iodine-125 seeds is described, which utilizes an anchor to stabilize an absorbable suture containing the seeds.

MICROBIOLOGY

REFER ALSO TO CITATION(S) 31561, 31728, 31853, 32828

PATHOLOGY

REFER ALSO TO CITATION(S) 32852, 32883

TRACER TECHNIQUES

REFER ALSO TO CITATION(S) 32838

PHYSIOLOGICAL SYSTEMS

REFER ALSO TO CITATION(S) 32800, 32832

32850 (BNL—28008) Effect of physical activity on body composition. Zanzi, I.; Ellis, K.J.; Aloia, J.; Cohn, S.H. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 8p. (CONF-800690—1). NTIS, PC A02/MF A01.

From 10. steenback symposium; Madison, WI, USA (8 Jun 1980).

It has been noted that the deleterious effects on bone calcium of prolonged periods of inactivity, such as bed rest, are halted following resumption of activity. It would seem possible in light of the observations that have been made, that exercise may stimulate bone formation and perhaps counter, to some extent, bone loss as observed in the osteoporosis of aging. The present study was designed to determine the relation between total body calcium, total body potassium and bone mineral content of the radius to the degree of physical activity in a population of normal subjects. Measurement of the calcium was made by in-vivo total body neutron activation analysis. Bone mineral content of the radius and total body potassium, (an index of lean body mass) were measured by photon absorptiometry and the whole body counter, respectively.

32851 IgG+ platelets in the marmoset: their induction, maintenance, and survival. Gengozian, N.; McLaughlin, C.L. (Oak Ridge Associated Universities, TN). Contract DE-AC05-76OR00033. *Blood;* **55**: No. 6, 885-890(Jun 1980).

Immunization of marmosets with platelets from another species of marmoset leads to antibody formation to the donor platelets, deposition of IgG on the host's platelets, and thrombocytopenia. This disease closely resembles posttransfusion purpura of man, which may develop after one or two transfusions of whole blood. The mode of immunization in the marmoset was found to be important: intravenous (i.v.) inoculations were without effect, while intramuscular (i.m.) immunizations led to the disease. Intramuscular inoculations were characterized by formation of 7S antibodies, as measured by indirect immunofluorescent (IF) and complement-dependent platelet cytotoxicity (PC) tests; in contrast, i.v. immunizations, while leading to 7S antibodies by the IF test, yielded only 19S antibodies reactive in the PC assay. The titers were also consistently higher with i.m. immunizations. Antibody was not limited to the donor platelets, but auto- or host-type reactivity was also present; this antibody was in very low titer and could be found only when the animal was thrombocytopenic. A primary finding was the ability to maintain increased deposition of IgG on the host's platelets in the

absence of thrombocytopenia by biweekly or monthly inoculations of the donor platelet antigen. The amount of IgG found on platelets of normal and immunized marmosets was comparable to that reported for normal humans and patients with cinical immune thrombocytopenia. Finally, platelet survival studies in animals with IgG+ platelets and normal platelet counts indicated a rapid turnover, suggesting operation of a compensatory mechanism to maintain platelet levels.

32852 Audiogenic seizures and cochlear damage in rats after perinatal antithyroid treatment. Van Milllesworth, L.; Norris, C.H. (Univ. of Tennessee Center for the Health Sciences, Memphis). Contract DE-AS05-76EV01643. *Endocrinology;* **106**: No. 6, 1686-1690(Jun 1980).

The feeding of goitrogens during pregnancy and lactation causes the offspring of rats to be partially deaf and persistently sensitive to audiogenic seizures. The most potent goitrogen, propylthiouracil, caused severe dysfunction and disorganization of the organ of Corti. Adult seizure-susceptible rats showed increased sensitivity to audiogenic seizures when they were fed propylthiouracil.

32853 Detection of prey by Calanus pacificus: implications of the first antennae. Contract DOE-E-76-S-06-2225-TA 26 (RLO-2225-T26-78. *Limnol. Oceanogr.;* **25**: No. 3, 545-549(May 1980).

Calanus pacificus, normally regarded as a passive filter-feeding copepod, displays active predatory behavior when fed with copepod nauplii. Larger nauplii are selectively preyed upon, even though they are better able to avoid capture than small nauplii. The involvement of the first antennae in the remote detection of motile prey is suggested by the experimental result that amputation of the antennae sharply reduces predatory feeding rates without affecting filter feeding.

32854 Relationship between egg size and naupliar size in the calanoid copepod Diaptomus clavipes Schacht. Contract W-7405-ENG-26. *Limnol. Oceanogr.;* **25**: No. 3, 549-552(May 1980).

A direct positive relationship was demonstrated between egg size and nauphar size in the calanoid copepod Diaptomus clavipes Schacht. Number of eggs per clutch and total clutch volume were inversely associated with measures of egg and naupliear size (egg volume, maximum egg length, naupllar volume, and maximum naupliar length). Thus, small clutches with large eggs give rise to large nauplii.

TRACER TECHNIQUES

32855 (LMF—72) Respiratory trace deposition models. Final report. Yeh, H.C. (ed.). (Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (USA)). Mar 1980. Contract AC04-76EV01013. 57p. NTIS, PC A04/MF A01.

Respiratory tract characteristics of four mammalian species (human, dog, rat and Syrian hamster) were studied, using replica lung casts. An in situ casting techniques was developed for making the casts. Based on an idealized branch model, over 38,000 records of airway segment diameters, lengths, branching angles and gravity angles were obtained from measurements of two humans, two Beagle dogs, two rats and one Syrian hamster. From examination of the trimmed casts and morphometric data, it appeared that the structure of the human airway is closer to a dichotomous structure, whereas for dog, rat and hamster, it is monopodial. Flow velocity in the trachea and major bronchi in living Beagle dogs was measured using an implanted, subminiaturized, heated film anemometer. A physical model was developed to simulate the regional deposition characteristics proposed by the Task Group on Lung Dynamics of the ICRP. Various simulation modules for the nasopharyngeal (NP), tracheobronchial (TB) and pulmonary (P) compartments were designed and tested. Three types of monodisperse aerosols were developed for animal inhalation studies. Fifty Syrian hamsters and 50 rats were exposed to five different sizes of monodisperse fused aluminosilicate particles labeled with ^{169}Yb. Anatomical lung models were developed for four species (human, Beagle dog, rat and Syrian hamster) that were based on detailed morphometric measurements of replica lung casts. Emphasis was placed on developing a lobar typical-path lung model and on developing a modeling technique which could be applied to various mammalian species. A set of particle deposition equations for deposition caused by inertial impaction, sedimentation, and diffusion were developed. Theoretical models of particle deposition were developed based on these equations and on the anatomical lung models.

32856 Carbon dioxide fixation and related properties in sections of the developing green maize leaf. Perchorowicz, J.T.; Gibbs, M. (Brandeis Univ., Waltham, MA). Contract EY-76-S-02-3231-14. *Plant Physiol.;* **65**: No. 5, 802-809(May 1980).

Light and dark $^{14}CO_2$ assimilation, pulse-chase ($^{14}CO_2$ followed by $^{12}CO_2$) labeling experiments both in the light and in the dark, photorespiratory activity and some enzymes (ribulose 1,5-bisphosphate (RuBP) carboxylase, phosphoenolpyruvate (PEP) carboxylase, and NADP-malic enzyme) were followed in sections of 2.5 centimeters from the base (younger tissue) to the tip (oldest tissue) of the green maize leaf. Tissue was taken from the third leaf of 12- to 16-day-old plants consisting of sections 0 to 2.5 centimeters (base), 4.5 to 7.0 centimeters (center) and 9.0 to 11.5 centimeters (top) measured from the base. Some of these properties were also determined in the intact leaves of 4-day-old maize plants. Electron microscopy indicated a Kranz anatomy in all sections. Differentiation into mesophyll granal chloroplats and bundle sheath agranal chloroplasts had taken place only in the center and top pieces. All of the sections contained PEP carboxylase, RuBP carboxylase, and NADP-malic enzyme. The ratio of PEP:RuBP carboxylase increased from 3.03 (top) to 4.66 (base) whereas the PEP carboxylase:NADP-malic enzyme ratio rose from 2.87 (top) to 9.57 (base). Under conditions of light or dark, the majority of the newly incorporated $^{14}CO_2$ was found in malate and aspartate in all sections and in 4-day-old leaves. The ^{14}C-labeling pattern typical of C_4 plants was present in the center and top sections and to a lesser extent in the 4-day-old leaves. In the base tissue, the percentage of radioactivity in malate and aspartate remained relatively constant both during photosynthesis and pulse-chase experiments. In contrast, radioactivity in glycerate-3-phosphate decreased with time coupled to an increase in sugar phosphates.

PUBLIC HEALTH

REFER ALSO TO CITATION(S) 32495

AGRICULTURE AND FOOD TECHNOLOGY

REFER ALSO TO CITATION(S) 31846, 32827, 32831

32857 (DOE/EV/00641—40) Comparison of mineral element cycling under till and no-till practices: an experimental approach to agroecosystems analysis. Stinner, B.R.; Crossley, D.A. Jr. (Georgia Univ., Athens (USA). Dept. of Entomology). 1 Aug 1980. Contract AS09-76EV00641. 21p. NTIS, PC A02/MF A01.

In this paper we give an overview of a research project which is attempting to integrate the approaches of agronomy and ecosystem ecology. We are attempting to apply methodologies and approaches of ecosystem study, in particular nutrient cycling, as a means of evaluating performance of agronomic systems. Specifically, we are comparing structure, function, and nutrient dynamics in a set of no-tillage and conventional plots.

32858 Combined effect of electrical stimulation and blade tenderization on some bovine muscles. Raccach, M.; Henrickson, R.L. (Oklahoma Agricultural Experiment Station, Stillwater). Contract E(40-1)-5097. *J. Food Process. Preserv.;* **3**: No. 1, 43-58(1979).

The electrical stimulation (ES) period was a very important factor determining the tenderness of three bovine muscles: Biceps femoris (BF), Longissimus dorsi (LD), and Semimembranosus (SM). Tenderness (shear force values) increased in most cases with increasing the ES period. An ES period of 15 min was optimal for obtaining a tenderness equal to that obtained by conventional processing of beef. The shortest ES period used (1 min) was adequate in most cases to set the muscles in rigor mortis and in preventing cold shortening. The tenderness of blade tenderized muscles was in most cases independent from the ES period. Blade tenderization was very effective to tenderize the BF muscle followed in decreasing order of efficacy by the LD and SM muscles. The cooking times and cooking losses of the three muscles were not affected by either the ES period or by blade tenderization.

BIOMEDICAL SCIENCES, APPLIED STUDIES

RADIATION EFFECTS ON BIOCHEMICALS

IN MICROORGANISMS

32859 Effect of the uvrD mutation on excision repair. Kuemmerle, N.B.; Masker, W.E. (Oak Ridge National Lab., TN). Contract- W-7405-ENG-26. *J. Bacteriol.;* **142**: No. 2, 535-546(May 1980).

A pair of related Escherichia coli K-12 strains, one of which contains the uvrD101 mutation, were constructed and compared for ability to perform various steps in the excision repair of deoxyribonucleic acid damage inflicted by ultraviolet radiation. The results of this study indicated: (i) ultraviolet sensitivity in the uvrD101 mutant was greater than that of wild type but less than that measured in an incision-deficient uvrA mutant; (ii) host cell reactivation paralleled the survival data; (iii) postirradiation deoxyribonucleic acid degrada-

tion was virtually identical in the two strains: (iv) incision, presumably at the sites of pyrimidine dimers, proceeded normally in the uvrD101 strain; (v) excision of pyrimidine dimers was markedly reduced in both rate and extent in the uvrD101 mutant; (vi) the amount of repair resynthesis was the same in both strains, and there was no evidence of abnormally long repair patches in the uvrD mutant; and (vii) rejoining of incision breaks was slow and incomplete in the uvrD strain. These data suggest that the ultraviolet sensitivity conferred by the uvrD mutation arises from inefficient removal of pyrimidine dimers or from failure to close incision breaks. The data are compatible with the notion that the uvrD+ gene product affects the conformation of incised deoxyribonucleic acid molecules.

RADIATION EFFECTS ON CELLS

EXTERNAL SOURCE

REFER ALSO TO CITATION(S) 32836

32860 (ORO—3631-10) **Radiation damage and repair in cells and cell components. Progress report: third new contract year.** Fluke, D.J.; Pollard, E.C. (Duke Univ., Durham, NC (USA). Dept. of Zoology). 1980. Contract AS05-76EV03631. 126p. NTIS, PC A07/MF A01.

Research progress for 1979-1980 is reported. Projects discussed include the process of radiation-induced repair, Weigle-reactivation, induced radioresistance, the induction of the recA gene product, uv mutagenesis, and the induction of lambda. (ACR)

RADIATION EFFECTS ON MICROORGANISMS

BASIC STUDIES

REFER ALSO TO CITATION(S) 32859

32861 **Double mutations induced in Escherichia coli by ultraviolet light.** Kubitschek, H.E. (Argonne National Lab., IL). Contract W-31-109-ENG-38. *J. Bacteriol.;* **142**: No. 2, 724-725(May 1980).

Double mutations to azide resistance and to bacteriophage T5 resistance of genes separated by more than 50 kilobases were induced in Escherichia coli WP2s in chemostat cultures by exposure to a single low dose of ultraviolet light. Frequencies of induced double mutations were three orders of magnitude greater than would be predicted by chance. Reversions from azide resistance and phage resistance occurred independently, showing that the double mutation was not due to pleiotropic effects of a single gene mutation. These results support earlier findings which show that low doses of ultraviolet light induce multiple gene mutations in Bacillus subtilis over a similarly broad range.

RADIATION EFFECTS ON ANIMALS

MAN

REFER ALSO TO CITATION(S) 32773, 32841, 32842, 33056

32862 (AD-A—076168) **The U.S. Army Radon Team: organization, capabilities and resources. Final report.** Rigotti, D.L. (Army Armament Research and Development Command, Aberdeen Proving Ground, MD (USA). Ballistics Research Lab.). Sep 1979. 131p. NTIS, PC A07/MF A01.

This report is intended to acquaint the reader with what the RADCON Teams are, how they operate, how they are presently constituted and their overall capabilities. Information on how the teams maintain the required readiness posture is also presented. Finally the various emergencies in which the RADCON Team has been involved over the past twenty years are described and the unique capabilities that the team possesses beyond that required by pertinent regulations are highlighted.

32863 (CONF-800392—1) **Radioactivity in man: levels, effects and unknowns.** Rundo, J. (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 16p. NTIS, PC A02/MF A01.

From Public meeting on federal research into biological effects of ionizing radiation; Bethesda, MD, USA (10 Mar 1980).

The report discusses the potential for significant human exposure to internal radiation. Sources of radiation considered include background radiation, fallout, reactor accidents, radioactive waste, and occupational exposure to various radioisotopes. (ACR)

RADIATION EFFECTS

MAN

REFER ALSO TO CITATION(S) 32844

NUCLIDE KINETICS AND TOXICOLOGY

32864 (P—300-80-006) **Potential impact of radiocarbon releases by the nuclear power industry. Consultant report.** Fairhall, A.W. (Washington Univ., Seattle (USA). Dept. of Chemistry). Feb 1980. 40p. California Energy Commission, Sacramento.

Reactors and especially reprocessing plants will potentially release large amounts of $^{14}CO_2$ to the environment. Enhanced levels of ^{14}C in the atmosphere and vegetation surrounding such facilities suggest siting them in nonagricultural areas. The buildup of this manmade ^{14}C in the atmosphere and biosphere is not expected to affect global ^{14}C levels significantly until the turn of the century. Control equipment at reprocessing plants and reactors could be installed to capture the gaseous ^{14}C and solidify and isolate it from the environment. The health consequences of ^{14}C are not fully understood. As a source of β radiation, reactor produced ^{14}C would be a relatively minor contributor to radiation dose compared with natural radiation sources. Because of carbon's key role in our genetic structure, the transmutation of decaying ^{14}C into nitrogen could potentially produce more cellular damage and health risk than ^{14}C would solely as a source of radiation. If such is the case, the hazards of ^{14}C and the need to control it would be greatly increased, but this requires further study.

MAN

REFER ALSO TO CITATION(S) 32773

ANIMALS

REFER ALSO TO CITATION(S) 32844

32865 (DOE/EV/01643—141) **Studies in iodine metabolism. Progress report and publications, 1979-1980.** Van Middlesworth, L. (Tennessee Univ., Memphis (USA). Dept. of Physiology and Biophysics). 1980. Contract AS05-76EV01643. 35p. NTIS, PC A03/MF A01.

Research programs for the years 1978-1980 is reported. The following subject areas are discussed: (1) iodine 131 monitoring in thyroids of sheep, cattle and humans; (2) radium monitoring in cattle thyroids; (3) the relationship of thyroid function to seizures in rats; (4) the effect of KSCN on thyroglobulin in mice; and (5) studies on excessive iodide intake. (ACR)

32866 **Manganese-52m, a new short-lived, generator-produced radionuclide: a potential tracer for positron tomography.** Atcher, R.W.; FriedMan, A.M.; Huizenga, J.R.; Rayudu, G.V.S.; Silverstein, E.A.; Turner, D.A. (Argonne National Lab., IL). *J. Nucl. Med.;* **21**: No. 6, 565-569(Jun 1980).

From 27. annual meeting of the Society of Nuclear Medicine; Detroit, MI, USA (24 Jun 1980).

A new generator system was developed using the Fe-52 → Mn-52m parent-daughter pair. Fe-52, half-life 8.3 hr, is isolated on an anion-exchange column, and Mn-52m is eluted in hydrochloric acid. Breakthrough is less than 0.01% and the yield is 75%. The 21.1-min half life of Mn-52m is ideal for use in sequential studies, but is long enough to permit radiochemical manipulations to control biodistribution. Animal studies indicate that Mn-52m is an ideal nuclide for myocardial imaging, combining rapid blood clearance and high concentration in the myocardium. An added advantage is that Mn-52m decays 98% by positron emission and is useful for positron computer tomography.

32867 **Effects of deferoxamine mesylate on gallium-67 distribution in normal and abscess-bearing animals: concise communication.** Oster, Z.H.; Som, P.; Sacker, D.F.; Atkins, H.L. (Brookhaven National Lab., Stony Brook, NY). Contract EY-76-C-02-0016. *J. Nucl. Med.;* **21**: No. 5, 421-425(May 1980).

Deferoxamine mesylate (DFO), given to rabbits 20 min after gallium-67 citrate, induces prompt and rapid urinary excretion of Ga-67 activity with concommitant decrease in blood and muscle activity. When DFO is given after 2 hr or later, the effect is smaller (15% decrease in blood activity compared with 50%). In abscess-bearing rats the same effect was observed: DFO accelerated the Ga-67 blood clearance by increasing urinary excretion. Tissue-distribution studies and direct counting of abscesses showed that DFO lowers Ga-67 activity in all organs as well as in the abscess if given 2 or 4 hr after Ga-67, citrate, but the abscess-to-blood ratio increases. At 24 hr after Ga-67 citrate, DFO administration causes an improvement in the ratios of abscess-to-blood and abscess-to-normal tissue. Thus, DFO could be used to decrease the radiation burden from Ga-

67 citrate after imaging has been performed, and also to increase the target-to-nontarget ratio.

CHEMICALS METABOLISM AND TOXICITY

REFER ALSO TO CITATION(S) 32766

32868 (COO—1599-177(Pt.1)) **Dissolved organic matter and lake metabolism. Technical progress report, 1 July 1979-30 June 1980.** Wetzel, R.G. (Michigan State Univ., Hickory Corners (USA). W.K. Kellogg Biological Station). 1980. Contract AS02-76EV01599. 39p. NTIS, PC A03/MF A01.

Progress in research to evaluate the impact of utilization of fossil fuels on surface water is reported. Analyses of regulatory mechanisms of growth and rates of carbon cycling center on evaluation of quantitative control interactions among the microflora of the pelagial zones of several lakes of progressively greater eutrophy, littoral photosynthetic producer-decomposer complex, and allochthonous inorganic-organic influxes and their biotic processing. The underlying thesis is that quantification of the dynamic carbon fluxes among these components and their rate control mechanisms by physical and chemical factors are fundamental to elucidation of the rate functions of lake eutrophication. A major portion of the research has been directed towards the fate and nutrient mechanisms regulating qualitative and quantitative utilization and losses of organic carbon synthesized within lakes and their drainage basins. It has become increasingly apparent that the wetland and littoral flora, and attendant epiphytic and benthic microflora, have major regulatory controls on biogeochemical cycling of whole lake systems. A major effort on factors regulating the metabolism of littoral macrophytes and attached algae has been coupled to integrated studies on their decomposition and the fate of detrital dissolved and particulate organic matter. These organic products are being coupled to influences on enzymatic activity and inorganic nutrient cycling.

CELLS

REFER ALSO TO CITATION(S) 32871

32869 (DOE/EV/10328—1) **Molecular biology of environmental aromatic hydrocarbons. Progress report, January 1, 1980-December 31,1980.** Weiss, S.B. (Chicago Univ., IL (USA)). Jul 1980. Contract AC02-80EV10328. 12p. NTIS, PC A02/MF A01.

Studies on three different aspects of hydrocarbon action have been investigated. These studies concern: I) the biochemical effect of benzo(a)pyrene-diol-epoxide (BPDE) on the replication of Simian virus 40; II) the reaction of benzo(a)pyrene-7,8-diol (BPD) with viral DNA; and III) the effect of PAH derivatives on RNA transcription.

MICROORGANISMS

REFER ALSO TO CITATION(S) 32875

32870 (CONF-800599—1) **Mutagenicity and toxicity of treated aqueous effluents from coal conversion processes.** Brand, J.I.; Klein, J.A.; Parkhurst, B.R.; Rao, T.K. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 21p. NTIS, PC A02/MF A01.

From 35. annual Purdue industrial waste conference; West Lafayette, IN, USA (13 May 1980).

Coal gasification and hydrocarbonization wastewaters were treated in a series of bench-scale unit operations representative of a conceptual treatment process. Ammonia stripping, biological oxidation, ozonation and carbon adsorption were performed with sampling before and after each major unit operation. In addition to monitoring more traditional parameters of treatment effectiveness, such as total carbon and phenol removal, acute toxicity and mutagenicity studies were done on these samples, both before and after fractionation. The major mutagenic activity of these wastes was in the basic and neutral fractions. Toxicity of untreated wastes was primarily due to organics, but toxicity after removal of the organics was also significant. Significant reduction in mutagenicity during primary processing steps was accompanied by high concentrations of known mutagens in the sludges produced during these steps, thus indicating that future research focusing on these sludges is desirable.

32871 (PNL-SA—8439) **Toxicologic studies of SRC materials.** Mahlum, D.D.; Pelroy, R.A.; Drucker, H.; Wilson, B.W.; Massey, M.J.; Schmalzer, D.K. (Battelle Pacific Northwest Labs., Richland, WA (USA); Environmental Research and Technology, Inc., Pittsburgh, PA (USA); Gulf Mineral Resources, Denver, CO (USA)). Feb 1980. Contract AC06-76RL01830. 16p. (CONF-800334—21). NTIS, PC A02/MF A01.

From 2. DOE environmental control symposium; Reston, VA, USA (17 Mar 1980).

Investigations on the toxicity of SRC materials are reported. Toxicological studies include: microbial mutageneis (Ames test); in vitro mammalian cell toxicity and transformation assays; epidermal carcinogenesis (skin painting); acute and subchronic oral toxicity; developmental toxicity; dominant lethal assays; inhalation toxicity; and dosimetry and metabolism. The materials tested include: SRC-I process solvent, wash solvent, and light oil; SRC-II heavy distillate, middle distillate, and light distillate; shale oil; crude petroleum; and pure carcinogens. (DC)

PLANTS

32872 (BNL—28091) **Isolation of a cadmium-binding complex from cabbage and tobacco leaves.** Wagner, C. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 19p. (CONF-800832—1). NTIS, PC A02/MF A01.

From Annual meeting of the American Society of physiologists; Pullman, WA, USA (Aug 1980).

Cd binding complexes with mol wts of approximately 10k daltons were observed in extracts, protoplast lysates, and protoplast cytosol obtained from the leaves of several plants. Extracts of the roots and stems of cabbage also contain the complex. In cabbage and tobacco the ligand appears to be both inducible and constitutive as determined by its association with Cd acquired either during growth of plants in the presence of the metal or after addition of the metal to extracts of Cd free leaves. Current efforts are directed toward determining the nature of the ligand.

INVERTEBRATES

REFER ALSO TO CITATION(S) 32881

VERTEBRATES

REFER ALSO TO CITATION(S) 31614, 32855, 32865, 32871

32873 (CONF-800680—1) **Acute toxicity of selected crude and refined shale oil derived and petroleum-derived substances.** Smith, L.H.; Haschek, W.M.; Witschi, H. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 27p. NTIS, PC A03/MF A01.

From Symposium on health effects investigations of oil shale development; Gatlinburg, TN, USA (23 Jun 1980).

General information was obtained on the toxicity of selected samples of crude Paraho shale oil and some of its derivatives, some crude petroleums, and 3 refined petroleum products. Five tests were used to determine the acute toxicity of these substances: acute lethality in mice following oral or intraperitoneal administration of a single dose; acute dermal toxicity of a single dose in rats; delayed-type allergic contact hypersensitivity in guinea pigs; primary eye irritation and primary skin irritation of a single dose in rabbits. Histopathologic changes induced in mice following intraperitoneal injection of a single large dose of crude shale oil and two of its hydrotreated derivatives were examined. Studies also have been initiated to examine the tumor inducing potential of selected samples. The test system used was the mouse lung adenoma bioassay. The present report describes our findings and shows that all compounds tested have very low or no acute toxic effects in laboratory animals.

32874 (CONF-800758—1(Draft)) **Experimental evaluation of skin carcinogenicity associated with chronic exposure to synthetic petroleums.** Holland, J.M. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 23p. NTIS, PC A02/MF A01.

From Toxicology forum on safety assessment for specific compounds; Aspen, CO, USA (27 Jul 1980).

Most fossil liquids, whether natural or synthetic, possess some degree of skin carcinogenic activity if applied at high enough concentration for sufficient time to genetically responsive experimental animals. Whether a synthetic petroleum shown to be capable of eliciting skin cancer in the mouse will have similar capability in exposed humans depends upon the potency of the material, the dosage and the person's individual susceptibility. This presentation describes the approach being taken to quantitiate skin carcinogenic potency. In addition to potency estimation, exposure conditions that could have an important bearing upon extrapolation of experimental animal data are investigated. These factors include the capacity of the material to induce skin irritation, and physical-chemical characteristics that influence skin localization and persistence of potentially carcinogenic components.

32875 (COO—4758-3) **Synthetic crude oils carcinogenicity screening tests. Progress report, September 15, 1979-March 15, 1980.** Calkins, W.H.; Deye, J.F.; King, C.F.; Hartgrove, R.W.; Krahn, D.F. (Du Pont de Nemours (E.I.) and Co., Wilmington, DE (USA)). 1980. Contract AC02-78EV10127. 29p. NTIS, PC A03/MF A01.

Four crude oils (H Coal-Fuel Oil Mode, Occidental in situ Shale Oil, Exxon Donor Solvent Liquid, and SRC II) which were distilled into four fractions (naphtha, mid-distillate, gas oil and

residue) for analysis and biological screening testing during the last report period were tested for mutagenicity by the Ames test and for tumor initiating activity by an initiation/promotion (skin painting) test. Substantial agreement exists between Ames and skin painting results. Low boiling naphtha fractions of the 4 crude oils showed little or no mutagenicity or tumor initiating activity by the two tests used. The higher boiling fractions (gas oils and residues) and the crude oils themselves were mutagenic and exhibited tumor initiation activity. The coal derived fractions were more active by both tests than the shale oil fractions.

32876 (LA—8445-MS) Cytogenetic effects of shale-derived oils and related by-products in mice. Meyne, J.; Deaven, L.L. (Los Alamos Scientific Lab., NM (USA)). Jul 1980. Contract W-7405-ENG-36. 9p. NTIS, PC A02/MF A01.

The cytogenetic effects of exposure to crude shale oil by either skin painting or intraperitoneal injectional and transplacental exposure of embryos to water derived from surface retort processing of shale oil were analyzed. Exposure to crude shale oils from two sources, Paraho and Occidental, by skin painting had essesntially no effect on the frequency of chromosomal aberrations in bone marrow cells. Intraperitoneal injection of the Paraho crude shale oil increased the frequency of chromosome damage in bone marrow cells at all three doses tested (0.5 ml, 1.0 ml, and 2.0 ml/kg). Metaphase analysis of cells from embryos at day 12 gestation from females that had been exposed to 1% Paraho retort water ad libitum from day 1 of gestation indicated that clastogenic compounds present in this water can cross the placenta and induce chromosomal damage in embryonic cells.

32877 (LMF—74) Fluidized bed combustion emissions toxicology program. Status report, October 1979. Carpenter, R.L. (ed.). (Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (USA)). Oct 1979. Contract AC04-76EV01013. 49p. NTIS, PC A03/MF A01.

Research progress is reported in studies to determine the potential health risk to man from the fluidized bed combustion of coal. The effort to date has consisted of field sampling from the 18" atmospheric pressure fluidized bed combustor (AFBC) to chemically and physically characterize potential effluents from the coal combustion FBC. This is followed by toxicological testing of effluents to determine their potential hazard to man. Information available to date is summarized. Special emphasis is given to comparisons between the FBC information available to data and information available from the conventional combustion of coal, even though these comparisons are between an experimental scale unit on one hand and full sized units on the other. It is concluded that fluidized bed combustor (FBC) particle emissions are comparable or lower than from conventional power plants. Fluidized bed combustor particle-associated organic emissions appear to be higher than estimated for conventional power plants. Fluidized bed combustor trace element emissions are comparable to conventional power plant emissions. Atmospheric fluidized bed combustion, pressurized fluidized bed combustion and conventional pulverized coal combustion generate similar organic compounds. Fluidized bed combustion causes less trace element enrichment in fine particles than has been observed in conventional combustion. No mutagenic activity was detected in the hydrocarbons of the vapor phase fraction of the stack breech effluent, but was found in hydrocarbons associated with some samples of bag filter (final cleanup device) or stack breech ash. There appears to be some positive correlation of ash-associated mutagenicity with higher combustion temperatures, but no correlation of mutagenicity with type of coal burned. Results of in vitro and in vivo cytotoxicity tests are also reported.

32878 Variability of the concentrations of seventeen trace elements in the muscle and liver of a single striped bass, Morone saxatilis. Heit, M. (Dept. of Energy, New York, NY). *Bull. Environ. Contam. Toxicol.;* **23**: No. 1/2, Awp 1979(Sep 1979).

The aim of this study was to determine which of seventeen toxic or potentially toxic elements may be eliminated from analyses in future investigations because of their occurrence in fish tissues at non-detectable or very low concentrations. These elements were chosen because the combustion of fossil fuels may be a significant source of anthropogenic releases of these elements in the environment.

32879 Morphological defect in shiner perch resulting from chronic exposure to chlorinated sea water. Thatcher, T.O. (Battelle Pacific Northwest Lab., Sequim, WA). *Bull. Environ. Contam. Toxicol.;* **21**: No. 4/5, 433-438(Mar 1979).

A morphological defect to one eye was observed in 17 of 20 young shiner perch exposed to chlorinated sea water, and it was absent in the 5 controls. The occurrence of the defect was apparently related to the concentration of total residual oxidants. Behavioral aberrations appeared to be associated with the morphological defect in exposed fish. Fish with severe cases were observed to be unsuccessful at feeding and at avoiding capture by dip-net. Fish which died during the experiment varied in the degree of severity of the observable morphological aspects of the defect.

32880 Comparison of the toxicity of nickel to the developing eggs and larvae of carp (Cyprinus carpio). Blaylock, B.G.; Frank, M.L. (Oak Ridge National Lab., TN). *Bull. Environ. Contam. Toxicol.;* **21**: No. 4/5, 604-611(Mar 1979).

The objectives of ths study were (1) to determine the toxicity of Ni to developing carp eggs and newly hatched carp larvae and (2) to compare the resistance of these two life stages to Ni toxicity.

32881 Accumulation of mercury in freshwater biota. Huckabee, J.W.; Elwood, J.W.; Hildebrand, S.G. (Oak Ridge National Lab., TN). pp 277-302 of Biogeochemistry of mercury in the environment. Nriagu (ed.). Amsterdam, Netherlands; Elsevier/North-Holland Biomedical Press (1979).

The literature on mercury accumulation by fish and other freshwater organisms was reviewed, and some generalizations are made. First the chemical aspects of mercury accumulation, is discussed including the forms of mercury found in fish and other aquatic biota and problems of mercury analysis. Secondly, the main physical and biological factors that control the amount of mercury accumulated by an organism are described. Finally, implications of the analytical and experimental data on uptake and retention of mercurials by freshwater biota are discussed.

MAN

REFER ALSO TO CITATION(S) 31788

32882 (DOE/EV/04968—T1) Evaluation of health effects of air pollution in the Chestnut Ridge area. Gruhl, J.; Schweppe, F.C. (Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.). 1980. Contract AS02-78EV04968. 89p. NTIS, PC A05/MF A01.

This project involves several tasks designed to take advantage of a very extensive air pollution monitoring system that is operating in the Chestnut Ridge region of Western Pennsylvania and the very well developed analytic dispersion models that have been previously fine-tuned to this particular area. The major task in this project is to establish, through several distinct epidemiologic approaches, health data to be used to test hypotheses about relations of air pollution exposures to morbidity and mortality rates in this region. This project affords a cost-effective opportunity for state-of-the-art techniques to be used in both costly areas of air pollution and health effects data collection. The closely spaced network of monitors, plus the dispersion modeling capabilities, allow for the investigation of health impacts of various pollutant gradients in neighboring geographic areas, thus minimizing the confounding effects of social, ethnic, and economic factors. The pollutants that are monitored in this network include total gaseous sulfur, sulfates, total suspended particulates, NOx, NO, ozone/oxidants, and coefficient of haze. In addition to enabling the simulation of exposure profiles between monitors, the air quality modeling, along with extensive source and background inventories, will allow for upgrading the quality of the monitored data as well as simulating the exposure levels for about 25 additional air pollutants. Another important goal of this project is to collect and test the many available models for associating health effects with air pollution, to determine their predictive validity and their usefulness in the choice and siting of future energy facilities.

OTHER ENVIRONMENTAL POLLUTANT EFFECTS

32883 (AD-A—076323) Effects of carbon dioxide laser radiation on bone. an initial report. Allen, G.W.; Adrian, J.C. (Army Inst. of Dental Research, Washington, DC (USA)). 17 Oct 1979. 11p. NTIS, PC A02/MF A01.

A study of the effects of carbon dioxide laser radiation on bone was conducted. Results indicated that wounds produced by a carbon dioxide laser have a retarded rate of healing then comparable sized lesions produced by a surgical bur. The retarded healing is probably due to the presence of a black, carbonaceous surface material resulting from the thermal effects of laser radiation.

HEALTH AND SAFETY

REFER ALSO TO CITATION(S) 32458

GEOSCIENCES

GEOSCIENCES

GEOLOGY AND HYDROLOGY

REFER ALSO TO CITATION(S) 31613, 31634, 31698, 32711, 32787

32884 (LA—8461-MS) **Geohydrology of Bandelier National Monument, New Mexico.** Purtymun, W.D.; Adams, H. (Los Alamos Scientific Lab., NM (USA)). Jul 1980. Contract W-7405-ENG-36. 28p. NTIS, PC A03/MF A01.

Bandelier National Monument is located on the eastern slopes of the Sierra de los Valles and the Pajarito Plateau. The Pajarito Plateau was formed by a series of ashflow and ashfall of rhyolite tuff. Perennial and intermittent streams have cut the surface of the plateau into a number of narrow southeast-trending mesas separated by deep canyons. Perennial surface flow occurs in Canon de los Frijoles and in the upper and middle reaches of Alamo, Capulin, Medio, and Sanchez Canyons. Of the five springs in and adjacent to the Monument, three discharge from perched aquifers and two from the main aquifer. Water in the deep main aquifer moves south to southeast in the Monument. Along the western edge of the Monument, the intrusion of volcanic rock of the San Miguel Mountains forms a barrier to the movement of water from the recharge area in the Valles Caldera. About 46.4 km^2 of the drainage area in the upper and middle reaches of Canon de los Frijoles, Alamo, Lummis and Capulin Canyons were burned over by a wildfire (the La Mesa Fire) in June 1977. The geohydrology of the area was determined to assess the availability of surface and ground water in the Monument and to determine the impact of the wildfire on these water resources.

32885 **Quaternary vegetation history of the Mississippi embayment.** Delcourt, P.A. (Univ. of Minnesota, Minneapolis); Delcourt, H.R.; Brister, R.C.; Lackey, L.E. *Quat. Res. (N.Y.);* **13**: 111-132(1980).

Nonconnah Creek, located in the loess-mantled Blufflands along the eastern wall of the Lower Mississippi Alluvial Valley in Tennessee displays a sedimentary sequence representing the Altonian Substage through the Woodfordian Substage of the Wisconsinan Stage. The site has a biostratigraphic record for the Altonian and Farmdalian Substages that documents warm-temperate upland oak-pine forest, prairie, and bottomland forest. At 23,000 y B.P., white spruce and larch migrated into the Nonconnah Creek watershed and along braided-stream surfaces in the Mississippi Valley as far as southeastern Louisiana. The pollen and plant-macrofossil record from Nonconnah Creek provides the first documentation of a full-glacial locality in eastern North America for beech, yellow poplar, oak, hickory, black walnut, and other mesic deciduous forest taxa. During the full and late glacial, the Mississippi Valley was a barrier to the migration of pine species, while the adjacent Blufflands provided a refuge for mesic deciduous forest taxa. Regional climatic amelioration, beginning about 16,500 y B.P., is reflected by increases in pollen percentages of cool-temperature deciduous trees at Nonconnah Creek. The demise of spruce and jack pine occurred 12,5000 y B.P. between 34° and 37°N in eastern North America in response to postglacial warming.

32886 (LBL—10711) **Probabilistic simulation of subsurface fluid flow: a study using a numerical scheme.** Buscheck, T.E. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Mar 1980. Contract W-7405-ENG-48. 187p. NTIS, PC A09/MF A01.

Thesis.

There has been an increasing interest in probabilistic modeling of hydrogeologic systems. The classical approach to groundwater modeling has been deterministic in nature, where individual layers and formations are assumed to be uniformly homogeneous. However, physically there is no such entity as a truly uniform and homogeneous unit. Single-number representations or deterministic predictions are subject to uncertainties. The approach used in this work models such uncertainties with probabilistic parameters. The resulting statistical distributions of output variables are analyzed. A numerical algorithm, based on axiomatic principles of probability theory, performs arithmetic operations between probability distributions. Two subroutines are developed from the algorithm and incorporated into the computer program TERZAGI, which solves groundwater flow problems in saturated, multi-dimensional systems. The probabilistic computer program is given the name, PROGRES. The algorithm has been applied to study the following problems: one-dimensional flow through homogeneous media, steady-state and transient flow conditions, one-dimensional flow through heterogeneous media, steady-state and transient flow conditions, and two-dimensional steady-state flow through heterogeneous media. The results are compared with those available in the literature.

GEOPHYSICS

32887 **Role of inertia in the fracture of rock.** Passman, S.L.; Grady, D.E.; Rundle, J.B. (Sandia National Laboratories, Albuquerque, New Mexico 87185). DE-AC04-76-DP00789. *J. Appl. Phys.;* **51**: No. 8, 4070-4075(Aug 1980).

A theory for the accumulation of damage in one dimension in fast deformation of a brittle material is developed. The theory is consistent with thermodynamics and takes crack inertia into account. The problem of damage accumulation due to a step pulse in strain is solved, and shows good agreement with experimental results.

SEISMOLOGY AND TECTONICS

REFER ALSO TO CITATION(S) 31698

GEOPHYSICAL SURVEY METHODS

REFER ALSO TO CITATION(S) 32100

32888 (LBL—11115) **Geophysical applications of squids.** Goubau, W.M. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Jun 1980. Contract W-7405-ENG-48. 11p. (CONF-8005104—2). NTIS, PC A02/MF A01.

From International conference on superconducting quantum interference devices; Berlin, F.R. Germany (5 May 1980).

Magnetic and electromagnetic fields are among the few probes available to geophysicists for studying the geological history of the earth and for determining properties of the earth deep below the surface. Many researchers have been reluctant to use SQUIDS because they require cryogenics, and because they have not always been as reliable and easy to operate as other devices. Thus, the use of SQUIDS has been limited largely to two areas: laboratory measurements or remnant magnetization and magnetic susceptibilities of rocks, and to magnetotellurics. In this paper these topics are discussed in more detail, giving particular attention to magnetotellurics, since it is here that SQUIDS have had the most profound influence. Finally, the criteria that SQUID magnetometers must satisfy to be useful in geophysics are discussed and suggestions are made for improving the reliability of the instruments.

MINERALOGY, PETROLOGY, AND ROCK MECHANICS

REFER ALSO TO CITATION(S) 31679, 31694, 31706

32889 (LA—8387-T) **Plastic deformation in two single crystal clinopyroxenes.** Kolle, J.J. (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 205p. NTIS, PC A10/MF A01.

Thesis.

Laboratory deformation experiments were carried out on two single crystal clinopyroxenes, chrome diopside, and hedenbergite. The tests were made in a Grigg's solid medium, triaxial, hot creep tester. A confining pressure of 10 kilobars was applied in all the experiments. The crystals were deformed at strain rates from 10^{-4} s^{-1} to 10^{-8} s^{-1} and at temperatures from 400°C to 1200°C. At temperatures above 900°C and applied stresses less than 5.2 kilobars flow in hedenbergite occurs by climb controlled dislocation glide. The results for mechanical twinning predict that this is not an important deformation mechanism unless the resolved shear stress on the twinning system exceeds 1.4 kilobars. The lack of dependence of twinning stress on strain rate implies that large rapid strains will occur in this mineral if the twinning stress is reached. This may provide a mechanism for deep focus earthquakes. The independence of twinning stress in clinopyroxenes from temperature, strain rate, or composition allows the use of this mineral as a geopiezometer. At plate margins where stresses are high the presence of mechanically twinned clinopyroxene grains allows the determination of the orientation and magnitude of the stresses responsible for the deformation.

32890 (SAND—80-0769) **Thermal conductivity of silicic tuffs: predictive formalism and comparison with preliminary experimental results.** Lappin, A. R. (Sandia Labs., Albuquerque, NM (USA)). Jul 1980. Contract AC04-76DP00789. 50p. NTIS, PC A04/MF A01.

Performance of both near- and far-field thermomechanical calculations to assess the feasibility of waste disposal in silicic tuffs requires a formalism for predicting thermal conductivity of a broad range of tuffs. This report summarizes the available thermal conductivity data for silicate phases that occur in tuffs and describes several grain-density and conductivity trends which may be expected to result from post-emplacement alteration. A bounding curve is drawn that predicts the minimum theoretical matrix (zero-porosity) conduc-

tivity for most tuffs as a function of grain density. Comparison of experimental results with this curve shows that experimental conductivities are consistently lower at any given grain density. Use of the lowered bounding curve and an effective gas conductivity of 0.12 W/m°C allows conservative prediction of conductivity for a broad range of tuff types. For the samples measured here, use of the predictive curve allows estimation of conductivity to within 15% or better, with one exception. Application and possible improvement of the formalism are also discussed.

32891 Melting of iron under core conditions. Brown, J.M.; McQueen, R.G. (Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Geophys. Res. Lett.;* 7: No. 7, 533-536(Jul 1980).

Melting in iron has been detected in shock wave experiments. Release wave velocities are determined using the overtaking rarefaction technique. Upon melting the shear modulus becomes zero leading to a decrease in the acoustic wave velocity behind the shock front. Two velocity discontinuities have been detected: (1) 200 +- 2 GPa at a calculated temperature of about 5500—6000K. The evidence indicates that the ϵ-υ transition occurs at 200 GPa and that υ iron melts near 250 GPa along the iron Hugoniot.

32892 Petrology of a sequence of pyroclastic rocks from the valley of Taurus-Littrow (Apollo 17 landing site). Heiken, G. (Los Alamos Scientific Lab., NM); McKay, D. *Geochim. Cosmochim. Acta, Suppl.;* 1933-1943(1978).

Samples collected from the rim of Shorty Crater, located in the valley of Taurus-Littrow (Apollo 17 landing site), including the orange glass droplets that have been the subject of a great deal of research and some controversy as to their origin. We have studied 13 samples from core 74001/2, collected at Shorty Crater; these samples represent most of the major stratigraphic units described by Nagle (1978). Below 5.5 cm, the samples consist entirely of whole and broken orange glass droplets and their partly to completely crystalline-black equivalents. We believe these droplets are pyroclastic ejecta from a lunar volcano. The crystalline droplets contain olivine and ilmenite as major phases. Minor phases include pyroxene, Cr-spinel, and metallic Fe. Four different properties of these droplets suggest that a wide range of cooling rates is represented. These properties are the grain shape, degree of crystallization, olivine shape or texture, and olivine composition. Many droplets contain vesicles indicating that a gas phase was involved in the eruption. Above a depth of 5.5 cm the core sequence has undergone in situ reworking by micrometeorites and contains exotic fragments including basalt and agglutinates. We conclude that the sequence below 5.5 cm, to a depth of 70 cm, represents 3.5 b.y. old volcanic pyroclastic ejecta which was deposited in a relatively short time period, was buried, and was subsequently brought to the lunar surface by the Shorty Crater impact where it was subjected to minor in situ reworking.

GEOCHEMISTRY

REFER ALSO TO CITATION(S) 31560, 31621, 31622, 31623, 31624, 31625, 31627, 31628, 32815, 32816, 32817

32893 (ORO—3852-39) **Distribution of actinide elements in sediments: leaching studies.** Scott, M.R.; Salter, P.F. (Texas A and M Univ., College Station (USA). Research Foundation). [nd]. Contract AS05-76EV03852. 40p. NTIS, PC A03/MF A01.

Previous investigations have shown that Fe and Mn oxides and organic matter can significantly influence the behavior of Pu and other actinides in the environment. A sequential leaching procedure has been developed in order to investigate the solid phase distribution of the actinides in riverine and marine sediments. Seven different sedimentary fractions are defined by this leaching experiment: an exchangeable metals fraction, an organic fraction, a carbonate fraction, a Mn oxide fraction, an amorphous Fe fraction, a crystalline Fe oxide fraction and a lattice-held or residual fraction. There is also the option of including a metal sufide fraction. A preliminary experiment, analyzing only the metals and not the actinide elements, indicates that this leaching procedure (with some modifications) is a viable procedure. The subsequent data should result in information concerning the geochemical history and behavior of these actinide elements in the environment.

OCEANOGRAPHY

REFER ALSO TO CITATION(S) 31874

PHYSICS RESEARCH

PHYSICS RESEARCH

ASTROPHYSICS AND COSMOLOGY

STARS

32894 Modal selection in pulsating stars. Simon, N.R.; Cox, A.N.; Hodson, S.W. (Theoretical Division, Los Alamos Scientific Laboratory, University of California). *Astrophys. J.;* 237: No. 2, 550-557(15 Apr 1980).

Initial-value and periodic nonlinear pulsation integrations are carried out for a series of double-mode Cepheid models ($P_1/P_0 \sim 0.7$) in the vicinity of the resonance $\omega_1+\omega_0=\omega_3$. None of the models tested shows persistent double-mode behavior. A new, semiquantitative description of modal selection, based upon the iterative theory of Simon, is introduced to analyze the nonlinear results. In the simplest version of this description, modal section categories emerge which are identical to those of Stellingwerf. Our hydrodynamic results also agree at least partially with Stellingwerf's in that we find a region in the red where the models approach (though never reach) simultaneous instability of both limit cycles. Analysis of resonant effects on modal selection in our calculations leads to the conclusion that models lying between the resonances $\omega_1+\omega_0=\omega_3$ and $P_3/P_0=0.5$ may yet be viable candidates for double-mode pulsation.

GALAXIES

32895 NGC 2264 molecular cloud: CO observations. Crutcher, R.M. (Univ. of Illinois, Urbana); Hartkopf, W.I.; Giguere, P.T. *Astrophys. J.;* 226: 839-850(15 Dec 1978).

The region of the young cluster NGC 2264 has been mapped in the J = 1 to 0 lines of ^{12}CO and ^{13}CO in order to study the molecular cloud from which the stars presumably formed. The interstellar material appears to be fragmented into at least six distinct clouds. The total mass is estimated both from the velocities of the cloud fragments by employing the virial theorem and from the CO column densities by assuming a CO/total mass ratio. The mass is about 2 x 10^4 Msub solar. The most massive fragment contains a strong infrared point source, which may be a protostar or a recently formed star. This fragment has about half of the total mass, and appears to be flattened and rotating with a period of about 5 million years. The infrared source and other stellar objects do not have sufficient luminosity to heat the dust in this fragment to the gas kinetic temperature. Evidently the grains cool rather than heat the gas. A possible gas heating mechanism, ambipolar diffusion, is discussed. 4 figures, 3 tables.

COSMOLOGY

REFER ALSO TO CITATION(S) 32938, 32939

32896 (SLAC-Trans—192(Rev.)) **Cosmological models of the universe with rotation of time's arrow.** Sakharov, A.D. (AN SSSR, Moscow. Fizicheskij Inst.). Jul 1980. Translation source information not available . 12p. NTIS, PC A02/MF A01.

The paper treats cosmological models of the universe with rotation of time's arrow. The hypothesis of cosmological CPT symmetry previously advanced by the author and the hypothesis of a many-sheeted open model with negative space curvature, with possible violation of CPT symmetry by an invariant combined charge, are presented. The statistical paradox of reversibility is discussed with respect to these models. The fundamental possibility of estimating (in absolute magnitude) the serial number of the expansion-contraction cycle corresponding to the present stage of evolution of the universe is pointed out for the many-sheeted model with rotation of time's arrow. The small dimensionless quantity δ^2/a^2 (where a is the hyperbolic radius and δ^{-3} the entropy density), which characterizes the average space curvature of the universe, is explained as a result of the evolution of the universe in the course of many successive expansion-contraction cycles.

ATOMIC, MOLECULAR, AND CHEMICAL PHYSICS

REFER ALSO TO CITATION(S) 32945

32897 Atom pair potentials of liquid nitrogen from diffraction data. Narten, A.H.; Johnson, E.; Habenschuss, A. (Chemistry Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *J. Chem. Phys.;* 73: No. 3, 1248-1255(1 Aug 1980).

The structure function of liquid nitrogen at 65 K and a molecular density of rho=0.01851 A^{-3} has been derived from new x-ray diffraction data. The RISM integral equation method was used to obtain a repulsive reference pair potential from this structure function. The results indicate that RISM integral equation method gives reliable repulsive reference potentials.

BEAMS AND THEIR REACTIONS

32898 (CONF-800738—1) **Aspects of the physics, chemistry, and technology of high intensity heavy ion sources.** Alton, G.D. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 80p. NTIS, PC A05/MF A01.

From 3. international conference on ion implantation: equipment and technique; Kingston, Ontario, Canada (8 Jul 1980).

Particular emphasis is placed on the technology of plasma discharge ion sources which utilize solid elemental or molecular compounds to produce vapor for the ionization process. A brief discussion is made of the elementary concepts underlying the formation and extraction of ion beams from plasma discharge sources. A limited review of low charge state positive ion sources suitable for accelerator use is also given.

32899 (GEPP-TIS—473) **Determining the mode of high voltage breakdowns in vacuum devices.** Miller, H.C.; Furno, E.J.; Sturtz, J.P. (General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.). 11 Aug 1980. Contract AC04-76DP00656. 12p. NTIS, PC A02/MF A01.

Devices were constructed which were essentially vacuum diodes equipped with windows allowing observation of high voltage breakdowns. The waveform of the applied voltage was photographed, and the x-ray output was monitored to investigate electrical breakdown in these vacuum diodes. Results indicate that breakdowns may be divided into two types: (1) vacuum (interelectrode) breakdown - characterized by a diffuse moderately bright discharge, a relative slow and smooth voltage collapse, and a large burst of x-rays, and (2) surface (insulator) flashover - characterized by a bright discharge with a very bright filamentary core, a relatively fast and noisy voltage collapse and no x-ray burst. Useful information concerning the type of breakdown in a vacuum device can be obtained by monitoring the voltage (current) waveform and the x-ray output.

32900 **Control of the motion of neutral molecules by a beam of electrons.** Greene, E.F.; Holber, W.M.; Lambropoulos, H.D. (Metcalf Chemical Laboratories, Brown University, Providence, Rhode Island 02912). *J. Chem. Phys.;* **73**: No. 3, 1212-1221(1 Aug 1980).

Experiments show that a beam of electrons tends to trap or guide neutral molecules so their motion is preferentially parallel or antiparallel to that of the electrons. In one apparatus the beam of electrons is coaxial with a molecular beam. When the latter is KCl, the presence of the electrons increases the flux of molecules to the surface ionization detector by a factor of up to 10^3 over that obtained in the absence of the electrons. In another apparatus a beam of electrons in one chamber can direct molecules of the residual gas through a slit into another chamber where the detector is a mass spectrometer. The trapping effect is most marked when the number of molecules is small, as it is for weak molecular beams (fluxes less than 10^7 molecule $cm^{-2}s^{-1}$ for thermal beams) or when the residual gas is at a low pressure ($<10^{-4}$Pa). A model based on the cumulative effect of many successive collisions of electrons with a molecule in the field of the beam of electrons provides a semi-quantitative interpretation of the measurements.

32901 **Diffusion enhancement due to low-energy ion bombardment during sputter etching and deposition.** Eltoukhy, A.H.; Greene, J.E. (Departments of Metallurgy, Mechanical Engineering, the Coordinated Science Laboratory and the Materials Research Laboratory, University of Illinois, Urbana, Illinois 61801). *J. Appl. Phys.;* **51**: No. 8, 4444-4452(Aug 1980).

The effects of low-energy ion bombardment on enhancing elemental diffusion rates at both heterojunction interfaces during film deposition and over the compositionally altered layer created during sputter etching alloy targets have been considered. Depth dependent enhanced interdiffusion coefficients, expressed as $D^*(x)=D^*(0)\exp(-x/L_d)$, where $D^*(0)$ is more than five orders of magnitude greater than thermal diffusion values, were measured in InSb/GaSb multilayer structures deposited by multitarget bias sputtering. $D^*(0)$ was determined from the amplitude u of the compositional modulation in the multilayered films (layer thicknesses between 20 and 45 A) as measured by superlattice x-ray diffraction techniques. The value of $D^*(0)$ was found to increase from 3×10^{-17} to 1×10^{-16} cm^2/sec as the applied substrate bias was increased from 0 to -75 V. However even at $V_a=0$, the diffusion coefficient was enhanced owing to an induced substrate potential with respect to the positive space-charge region in the Ar discharge. The diffusion length of L_d of the ion bombardment created defects was ~1000 A. Enhanced diffusion also has a significiant effect on the altered layer thickness x_e and the total sputtering time t_e 'or ion dose) required to reach steady state during ion etching of multielement targets. The effects of using an exponentially depth dependent versus a constant value of the enhanced diffusion coefficient on calculated values of x_e and t_e in single-phase binary alloys were considered. The results show that both x_e and t_e are considerably larger using a depth dependent $D^*(x)$, when $L_d < D^*(0)/v$, where v is the steady-state surface recession velocity during sputter etching. However, when $L_d > D^*(0)/v$, the usual case for most sputtering applications, the two solutions approach each other.

32902 **Studies associated with the development of a modified University of Aarhus negative ion source.** Alton, G.D.; Blazey, G.C. (Oak Ridge National Lab., TN (USA)). *Nucl. Instrum. Methods;* **166**: No. 2, 105-116(15 Nov 1979).

A high intensity negative ion source, based in principle on a source developed at the University of Aarhus, has been designed and constructed. This source demonstrates a high degree of reliability, operational stability and long lifetime. The plasma generation mechanism produced a uniform density and thus uniform sputter probe wear. The results of studies associated with the source development are given which establish relationships between negative ion yield and certain operation parameters - principally oven temperature and sputter probe voltage. The parameters for maximizing yields from a number of elemental materials were observed to occur at oven temperatures of approximately 200°C and sputter probe voltages between -900 and -1200 V depending upon the cathode material. Negative ion yields are observed to increase with sputter probe voltage according to a theoretically predictable $V^{sup}(5/2)$ law. The important design aspects of the source and negative ion yields observed to-date are given. Application of the Langmuir-Saha theory is made to the yield data and changes in work function necessary to produce observed negative ion yields are computed. The measured changes in work function agree in several instances with the theoretical formulation of Broeder et al.

ATOMIC AND MOLECULAR PROPERTIES

REFER ALSO TO CITATION(S) 32908

32903 (MLM—2740(OP)) **Consistent spherical potential function for para hydrogen.** McConville, G.T. (Mound Facility, Miamisburg, OH (USA)). 1980. Contract AC04-76DP00053. 17p. (CONF-800830—1). NTIS, PC A02/MF A01.

From 14. international conference on thermodynamics and statistical mechanics; Edmonton, Alberta, Canada (17 Aug 1980).

Five recently proposed potential functions have been compared to data for the second viral coefficient, the bound state energy difference, the differential and total scattering cross sections. None of the potentials can describe the data in a consistent way. Using the Hartree-Fock Dispersion form of Ahlrich, et al, and allowing the dispersion damping parameter to be varied, it is found that D = 1.31 produces a consistent description of all the properties except the differential cross section data.

32904 **Oscillator strength of the C_2 Swan bands.** Brewer, L.; Hagan, L. (Univ. of California, Berkeley). Contract W-7405-ENG-48. *High Temp. Sci.;* **11**: No. 4, 233-263(Dec 1979).

Absolute emission and absorption measurements of rotational lines and band heads of the 0-0 C_2 Swan system have been made for carbon vapor inequilibrium with graphite at 2853-3051°K. The data were treated for deviation from the linear curve of growth and for partial reversal in experiments with an external light source. At 3000°K $fN''_{v0K1J0} = 1.6 \times 10^9$ molecules/cm^3. The sum over all rotational lines of the 0-0 transition yields $fN''_{v0} = 6.1 \times 10^{11}$ molecules/cm^3. The average of nine independent fN determinations from the literature yield $fN''_{v0K1J0} = 1.9 \times 10^9$ molecules/cm^3. These values averaged with lifetime measurements yield $f_{0,0} = 0.027$ corresponding to a radiative lifetime or the v' = 0 level of 110 ns. The values are consistent with $\Delta H_0°/R = 101{,}000$ K for the sublimation of C_2 ($a^3\Pi$) from graphite. These values for the Swan system are compared with the corresponding values from the literature for six other band systems of C_2. 69 references, 1 figure, 5 tables.

POSITRONIUM, MUONIUM, AND MUONIC AND MESIC ATOMS AND MOLECULES

REFER ALSO TO CITATION(S) 32563, 33022

COLLISION PHENOMENA

32905 (AD-A—075951/4) **Summary questionnaire response 7901, october 1979. Progress summary report nov 78-oct 79.** Sellin, I.A. (Tennessee Univ., Knoxville (USA)). Oct 1979. Contract N00014-75-C-0474. 14p. NTIS, PC A02/MF A01.

This document is an annual summary questionnaire response associated with work performed on the project entitled 'Structure of

Highly Ionized Heavy Ions and Associated Collision Phenomena in the MeV/nucleon Range.' (Author)

32906 (AD-A—076102) **Solvable model for optical and radiative collisions.** Robinson, E.J. (New York Univ., NY (USA). Dept. of Physics). Sep 1979. Contract N00014-77-C-0553. 7p. NTIS, PC A02/MF A01.

The related problems of optical and radiative collisions are examined theoretically. The actual R/sup n/ potentials found in nature are simulated by powers of the hyperbolic secant, which enables one to obtain closed form solutions for the transition probabilities in the weak-field regime.

32907 (IS-T—892) **Inverse Raman effect: applications and detection techniques.** Hughes, L.J. Jr. (Ames Lab., IA (USA)). Aug 1980. Contract W-7405-ENG-82. 145p. NTIS, PC A07/MF A01.

Thesis.

The processes underlying the inverse Raman effect are qualitatively described by comparing it to the more familiar phenomena of conventional and stimulated Raman scattering. An experession is derived for the inverse Raman absorption coefficient, and its relationship to the stimulated Raman gain is obtained. The power requirements of the two fields are examined qualitatively and quantitatively. The assumption that the inverse Raman absorption coefficient is constant over the interaction length is examined. Advantages of the technique are discussed and a brief survey of reported studies is presented.

32908 (LA—8407-PR, pp 36-39) **Photodetachment resonances near n = 3.** Jun 1980.

In Medium-energy physics program. Progress report, August 1-October 31, 1979.

Narrow resonances in the H^- photodetachment cross section near the hydrogenic n = 3 threshold are reported. 800-MeV H^- ions collided with photons from a uv laser. Energies and widths for ^1P resonances are tabulated, and the physical interpretation of these states is discussed. 2 figures, 1 table. (RWR)

32909 **Experimental study of two-body time correlations in gaseous xenon.** Groome, L.J.; Teitsma, A.; Egelstaff, P.A.; Mook, H.A. (Department of Chemical Engineering, Tulane University, New Orleans, Louisiana, 70118). *J. Chem. Phys.;* **73**: No. 3, 1393-1397(1 Aug 1980).

The Van Hove scattering function, $S(Q,\omega)$, has been measured for xenon gas at five state conditions along the 30 C isotherm using the time-of-flight correlation spectrometer at Oak Ridge National Laboratory (ORNL). The data are normalized by division of $S(Q,\omega)$ by the static structure factor so that at each Q value the normalized function has unit area: these curves are bell-shaped and are compared to two kinetic calculations by Dufty and Lindenfeld (unpublished). At the lowest density (0.185×10^{22} atom/cm^3) the experimental data are consistent with the perfect gas and the two models. But at the highest density (0.458×10^{22} atom/cm^3) the data probably differ significantly from these models.

ATOMIC AND MOLECULAR THEORY

REFER ALSO TO CITATION(S) 32942

FLUID PHYSICS

GENERAL FLUID DYNAMICS

REFER ALSO TO CITATION(S) 33066, 33157

32910 (LA—8209) **HYDSES: a subroutine package for using Sesame in hydrodynamic codes.** Abdallah, J. Jr.; Kerley, G.I.; Bennett, B.I.; Johnson, J.D.; Albers, R.C.; Huebner, W.F. (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 27p. NTIS, PC A03/MF A01.

HYDSES is a subroutine package developed for using Sesame equation-of-state and opacity data in hydrodynamic codes. This package is faster and more space efficient, and includes more capability than the previous package. The HYDSES package has been used successfully in hydrodynamic calculations. The package and its use in hydrodynamic codes are described. 3 figures, 8 tables

32911 (UCRL—84455) **Adiabatic Hamiltonian deformation, linear response theory, and nonequilibrium molecular dynamics.** Hoover, W.G. (California Univ., Davis (USA). Dept. of Applied Science; California Univ., Livermore (USA). Lawrence Livermore National Lab.). 28 May 1980. Contract W-7405-ENG-48. 9p. (CONF-800694—1). NTIS, PC A02/MF A01.

From Sitges international school and symposium on statistical mechanics; Sitges, Spain (9 Jun 1980).

Although Hamiltonians of various kinds have previously been used to derive Green-Kubo relations for the transport coefficients, the particular choice described is uniquely related to thermodynamics. This nonequilibrium Hamiltonian formulation of fluid flow provides pedagogically simple routes to nonequilibrium fluxes and distribution functions, to theoretical understanding of long-time effects, and to new numerical methods for simulating systems far from equilibrium. The same methods are now being applied to solid-phase problems. At the relatively high frequencies used in the viscous fluid calculations described, solids typically behave elastically. Lower frequencies lead to the formation of dislocations and other defects, making it possible to study plastic flow. A property of the nonequilibrium equations of motion which might be profitably explored is their effective irreversibility. Because only a few particles are necessary to generate irreversible behavior, simulations using adiabatic deformations of the kind described here could perhaps elucidate the instability in the equations of motion responsible for irreversibility.

SUPERFLUIDITY

32912 (DOE/ER/01569—150) **Observation of quantized circulation in rotating superfluid ^{4}He.** Karn, P.W. (Minnesota Univ., Minneapolis (USA)). Apr 1979. Contract AS02-76ER01569. 36p. NTIS, PC A03/MF A01.

Thesis.

The quantized circulation of rotating superfluid helium 4 was measured by monitoring the time rate of precession of the plane of vibration of a vibrating wire lying along the cylindrical axis of the container. (GHT)

32913 **Three-particle distribution function in liquid ^{4}He.** Lee, F.J.; Lee, D.K. (Department of Physics, National Tsing Hua University, Hsinchu, Taiwan, China). *Phys. Rev., B: Condens. Matter;* **22**: No. 1, 206-213(1 Jul 1980).

Several approximate forms of the three-particle distribution function are studied using error functions introduced to estimate the accuracy with which they satisfy the sequential relation connecting the two- and three-particle distribution functions. The procedure is based on modification and extension of the formal density-cluster expansion developed by Abe in the context of the classical statistical mechanics of an imperfect gas. Numerical evaluation of the error functions are carried out by expanding functions of the complicated multidimensional cluster integrals in terms of the associated Legendre functions. The results obtained numerically in the first three lowest-order approximations for the ground state of liquid ^{4}He at equilibrium density show that the overall magnitude of the error function decreases significantly as the order of approximation increases to the next higher order.

32914 **Model formalism of liquid ^{3}He-B at equilibrium.** Goldstein, L.; Goldstein, J.C. (University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico). *J. Low Temp. Phys.;* **39**: No. 1, 191-215(Apr 1980).

The approximate formal treatment of the nuclear spin system of normal liquid ^{3}He given some time ago is extended to the ordered ^{3}He phase. The formalism leads to the prediction of normal thermal behavior of ^{3}He-B at lower pressures and at temperatures approaching its phase-boundary temperatures. In contrast to the disordered normal liquid phase, which is thermally anomalous, the entropy of the ^{3}He-B decreases on isothermal compression, or its isobaric volume expansion coefficient is positive. The equilibrium thermal behavior of ordered ^{3}He-B is thus qualitatively different from that of disordered liquid ^{3}He. Experimental control of these aspects of the liquid ^{3}He phase transformation is lacking at the present time. Both early and new ^{3}He-B paramagnetic susceptibility data, extended recently over a wide reduced-temperature range, disclose a fundamental competition between the spontaneous ordering mechanism responsible for the existence of ^{3}He-B and the specific ordering process imposed upon this phase on application of an external constant and uniform magnetic field. As a consequence, magnetized ^{3}He-B will be shown to increase its entropy on isothermal magnetization and to cool on adiabatic magnetization. The magnetocaloric effect is, however, only moderate. The competition of the ordering process leads to the delay or possibly even to the suppression of the formation of the ordered phase, a state of affairs foreseen in our earlier work. At low or moderate magnetic field strengths, the zero-field phase-boundary temperatures are shown to shift toward lower temperatures while, simultaneously, the order of the phase change decreases, from second order, in the absence of the field, to first order. Although of model-theoretic character, involving limitations of various types, the rich physical content of ^{3}He-B at equilibrium clearly emerges in the present work.

PARTICLE INTERACTIONS AND PROPERTIES - EXPERIMENTAL

ELECTROMAGNETIC INTERACTIONS

REFER ALSO TO CITATION(S) 32727, 32926

32915 Study of the Okubo-Zweig-Iizuka rule in exclusive photoproduction reactions. Goodman, M.C.; Avery, P.; Butler, J.; Gladding, G.; O'Halloran, T.; Russell, J.J.; Wattenberg, A.; Wiss, J.; Binkley, M.; Cumalat, J.; Gaines, I.; Gormley, M.; Loveless, R.L.; Peoples, J.; Atiya, M.S.; Holmes, S.D.; Knapp, B.C.; Lee, W.; Wisniewski, W. (Department of Physics, University of Illinois, Urbana, Illinois 60801). *Phys. Rev., D;* 22: No. 3, 537-552(1 Aug 1980).

A study of the Okubo-Zweig-Iizuka (OZI) rule has been performed in a high-energy photon beam by comparing the production ratios of exclusive meson final states. Measurement of the ratio $\sigma(\gamma A \rightarrow \text{phi}\pi^+\pi^- A)/\sigma(\gamma A \rightarrow \omega\pi^+\pi^- A) = 0.10 +- 0.02$ is evidence that the OZI rule does not suppress this photoproduction reaction to the extent observed in phi decays and in production by hadrons. The ratios of other exclusive photoproduction reactions are also presented.

32916 Magnetic moment of the lambda hyperon. Schachinger, L.C. New Brunswick, NJ; Rutgers-the State Univ. (1978). 111p. University Microfilms Order No. 79-10,434.

Thesis (Ph. D.).

The magnetic moment of the lambda hyperon was measured to be -0.6138 +- 0.0047 nuclear magneton. The experiment was performed in the neutral hyperon beam at the Fermi National Accelerator Laboratory. Three million $\Lambda^0 \rightarrow p\ \pi^-$ decays were detected in a multiwire proportional chamber spectrometer. The lambda sample, produced inclusively by 400-GeV protons, had an average momentum of 114 GeV/c and an average polarization of 0.085. This polarization was precessed through angles as large as 153 degrees.

WEAK INTERACTIONS

REFER ALSO TO CITATION(S) 32916

32917 (BNL—28119) **Experimental constraints on models of CP violations.** Schmidt, M.P.; Adair, R.K.; Black, J.K.; Blatt, S.R.; Campbell, M.K.; Kasha, H.; Larsen, R.C.; Leipuner, L.B.; Morse, W.M. (Yale Univ., New Haven, CT (USA); Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 13p. (CONF-800724—11). NTIS, PC A02/MF A01.

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

A review is presented of the experimental efforts at the Brookhaven AGS to study the nature of CP violation in the decays of kaons. The current research focuses on sensitive searches for a violation of time-reversal (T) invariance in the decay $K \rightarrow \mu\nu$/sub μ/ as evidenced by a nonzero component of muon polarization normal to the decay plane. The ongoing program of research includes a study of direct CP violation in the decays of neutral kaons through a precise (1%) measurement of absolute value of eta$_{00}$/ absolute value of eta/sub +-/, the ratio of the CP violating amplitudes for the decays of neutral kaons into neutral and charged two pion final states. Results will be presented on the decay K/sub L/$^0 \rightarrow \pi^-\mu^+\nu$/sub μ/, where we have found the ratio of T violating to T conserving transverse polarization of the muons to be $<P/\text{sub } n// P/\text{sub } t/> = 0.004 +- 0.009$, consistent with T invariance. Preliminary results for the polarization of muons in the decay $K^+ \rightarrow \pi^0\mu^+\nu$/sub μ/ will be discussed.

32918 Transverse momentum and angular distributions of hadrons in muon-proton scattering and tests of quantum chromodynamics. Tao, C.; Hicks, R.G.; Anderson, H.L.; Booth, N.E.; Francis, W.R.; Gordon, B.A.; Kinnison, W.W.; Kirk, T.B.W.; Loomis, W.A.; Matis, H.S.; Mo, L.W.; Myrianthopoulos, L.C.; Pipkin, F.M.; Proudfoot, J.; Quirk, T.W.; Sessoms, A.L.; Shambroom, W.D.; Skuja, A.; Staton, M.A.; Williams, W.S.C.; Wilson, R.; Wright, S.C. (High Energy Physics Laboratory and Department of Physics, Harvard University, Cambridge, Massachusetts 02138). *Phys. Rev. Lett.;* 44: No. 26, 1726-1729(30 Jun 1980).

The properties of the transverse momenta and angular distributions of hadrons produced in muon-proton scattering with first-order quantum-chromodynamics calculations. The quantum-chromodynamics prediction for the Q^2 dependence of the average hadron transverse momentum squared agrees with the data provided a constant term is added in quadrature to the prediction. This additive term is attributed to the intrinsic transverse momentum of the quarks in the nucleon and to the transverse momentum inherent in quark fragmentation.

32919 Measurement of $\Sigma^- \rightarrow \Lambda$ e-ν and $\Xi^- \rightarrow \Lambda$ e-ν branching ratios. Herbert, M.L. Pittsburgh, PA; Univ. of Pittsburgh (1978). 183p. University Microfilms Order No. 79-02,760.

Thesis (Ph. D,).

A counter-spark chamber experiment was performed in the Brookhaven National Laboratory 21-GeV/c negative hyperon beam to study the semi-leptonic beta decays $\Sigma^- \rightarrow \Lambda$ e-$\nu/\Sigma^- \rightarrow n\pi^-$ and $\Xi^- \rightarrow \Lambda$ e-$\nu/\Xi^- \rightarrow \Lambda\pi^-$. These rarely observed decays of strange baryons test Cabibbo theory and CVC. Previously, the rate for $\Xi^- \rightarrow \Lambda\ e^-\nu$ has not been measured separately from the $\Xi^- \rightarrow \Sigma^0 e^-\nu$ mode in a counter-spark chamber experiment. The events were reconstructed by measuring the momenta of the incident hyperon, the electron, and the decay products(p,π) of the Λ. From a total of 10^6 Ξ^- topology triggers, of which 7.5 x 10^5 had an electron Cherenkov counter in coincidence, these were 129 $\Sigma^- \rightarrow \Lambda\ e^-\nu$ candidates and 15 $\Xi^- \rightarrow \Lambda\ e^-\nu$ candidates including about 4% background for $\Sigma^- \rightarrow \Lambda$ eν and about 30% background for $\Xi^- \rightarrow \Lambda$ eν. The branching ratios were measured to be (0.59 +- 0.06) x 10^{-4} and (0.30 +- 0.11) x 10^{-3}, respectively.

STRONG BARYON-INDUCED INTERACTIONS

32920 (DOE/ER/02572—5) **Medium energy measurements of n-p parameters. Progress in research, January 1-December 31, 1979.** (Texas Univ., Austin (USA). Dept. of Physics). Jan 1980. Contract EY-76-C-05-2972. 53p. NTIS, PC A04/MF A01.

Research on the experimental determination of nucleon-nucleon amplitudes at intermediate energies is summarized. Separate abstracts were prepared for four of the sections of this report. 20 figures. (RWR)

32921 (DOE/ER/02972—5, pp 15-22) **N-p analyzing power at LAMPF energies.** Jan 1980.

In Medium energy measurements of n-p parameters. Progress in research, January 1-December 31, 1979.

Experimental details are given, and then the energy dependence of A/sub y/ for n-p scattering at 110°(c.m.) is shown from 300 to 800 MeV. There is a broad minimum near 550 MeV. Angular distributions in A/sub y/ from 60° to 160° are presented for 575, 625, and 800 MeV. 7 figures. (RWR)

32922 (DOE/ER/02972—5, pp 23-26) **Progress on data analysis for experiment 66.** Jan 1980.

In Medium energy measurements of n-p parameters. Progress in research, January 1-December 31, 1979.

The analyzing power A/sub y/ extracted from np scattering is plotted over the range 275 to 800 MeV. The results for the spin correlation parameter A/sub yy/ at 670 MeV are shown for the range 107° to 165°(c.m.). 2 figures. (RWR)

32923 (LA—8335-C(Vol.3)) **Proceedings of the Workshop on Program Options in Intermediate-Energy Physics. Keynote address: New directions in elementary particle physics - pantip from very low to very high energies .** Jacob, M. (Los Alamos Scientific Lab., NM (USA)). May 1980. Contract W-7405-ENG-36. 23p. (CONF-7908121—2(Vol.3)). NTIS, PC A02/MF A01.

From Workshop on program options in intermediate-energy physics; Los Alamos, NM, USA (20 Aug 1979).

The recent development of cooling techniques offers the possibility to obtain intense sources of antiprotons, stacking them as they are produced at a multi-GeV accelerator. The wide array of applications presently considered, ranging from reactions at extremely low energy in the case of p anti p atoms to reactions at hundreds of GeV in the case of head-on collisions between protons and antiprotons accelerated at the same time in a super synchrotron, is reviewed. Special emphasis is put on the present CERN program, which will reach the data-taking stage in 1981. The study of p anti p interactions is meant as an illustration of how new possibilities open new directions in elementary particle physics, whether reaching energies hitherto much beyond accelerator possibilities or developing new lower-energy beams improved tremendously over those presently available. 14 figures, 1 table.

32924 Polarization parameters and angular distributions in π^{+-}p elastic scattering at 100 GeV/cand in pp elastic scattering at 100 and 300 GeV/c. Kline, R.V.; Law, M.E.; Pipkin, F.M.; Auer, I.P.; Hill, D.; Sandler, B.; Underwood, D.; Yokosawa, A.; Jonckheere, A.; Koehler, P.F.M.; Brueckner, W.; Chamberlain, O.; Shapiro, G.; Steiner, H.; Johnson, W.; Snyder, J.H.; Zeller, M.E. (Harvard University, Cambridge, Massachusetts 02138). *Phys. Rev., D;* 22: No. 3, 553-572(1 Aug 1980).

Measurements of the polarization parameters and angular distributions are reported for π^{+-}p elastic scattering at 100 GeV/c and for pp elastic scattering at 100- and 300-GeV/c incident momentum. The π^{+-}p data cover the kinematic range $0.18 < \text{or} = -t < \text{or} = 1.10$ GeV^2 and are in agreement with current Regge-model predictions. The pp data cover the kinematic range $0.15 < \text{or} = -t < \text{or} = 1.10$ GeV^2 and $0.15 < \text{or} = -t < \text{or} = 2.00$ GeV^2 at 100 and 300 GeV/c, respectively, and are found to be consistent with absorption-model predictions.

STRONG MESON-INDUCED INTERACTIONS

REFER ALSO TO CITATION(S) 32924, 32999

32925 **Search for narrow p-barp states.** Carroll, A.S.; Chiang, I.; Johnson, R.A.; Kycia, T.F.; Li, K.K.; Litten berg, L.S.; Marx, M.D.; Cester, R.; Webb, R.C.; Witherell, M.S. (Brookhaven National Laboratory, Upton, New York 11973). AC02-76CH00016. *Phys. Rev. Lett.;* **44**: No. 24, 1572-1575(16 Jun 1980).

We have searched for the narrow states of the p-barp system in the mass range from 2000 to 2400 MeV/c^2 in the inclusive channel $\pi^- + (p \text{ or } C) \rightarrow p\text{-}barp + X^0$. No statistically significant enhancements in the data have been observed.

PARTICLE INTERACTIONS AND PROPERTIES - THEORETICAL

ELECTROMAGNETIC INTERACTIONS

REFER ALSO TO CITATION(S) 32932, 32939

32926 **Problem of R in e^+e^- annihilation.** Barnett, R.M.; Dine, M.; McLerran, L. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). DE-AC03-76SF00515. *Phys. Rev., D;* **22**: No. 3, 594-609(1 Aug 1980).

A careful analysis is presented of the most recent data for $R(e^+e^- \rightarrow \text{hadrons})$ using improved theoretical techniques. The analysis is based on a generalized method for smoothing R. We show why the hadronic cross section is potentially one of the best tests of quantum chromodynamics. The theoretical complications such as unknown parameters and nonperturbative corrections are discussed, and resulting theoretical uncertainties are estimated. Some previously neglected QED corrections are accounted for. We find that for $\sqrt{s}$-bar near 7 GeV, the data lie about 15—17 % above the theory; the experimental uncertainty is +- 10% (dominated by systematics). For $\sqrt{s}$-bar near 5 GeV, the difference is only 5—8 %. This apparent discrepancy may well be due to systematic problems in the experiment. For completeness we consider the possibility that there is a threshold for new particles at $\sqrt{s}$-bar $\approx$ 6 GeV. We consider new quarks, Higgs bosons, color-sextet quarks, integrally charged and even fractionally charged leptons. While most of these hypotheses are not particularly attractive, some cannot be ruled out.

32927 **CP violation in gauge theories and the electric dipole moment of the neutron.** Nanopoulos, D.V.; Yildiz, A.; Cox, P.H. (Lyman Laboratory of Physics, Harvard University, Cambridge, Massachusetts 02138). ER-78-S-02-4999. *Ann. Phys. (N.Y.);* **127**: No. 1, 126-148(Jun 1980).

A nonvanishing contribution to the neutron electric dipole moment in CP-violating gauge theories of the weak interactions, arising from interaction of the photon with two-quark subsystems of the three-bound-quark neutron system, is calculated. In the Kobayashi—Maskawa model the resulting value of the moment is estimated as $O(10^{-33})$ e cm; however, strong interaction corrections (gluonic radiative corrections) give quark moment contributions which may be numerically larger (possibly 10/sup 030plus-or-minus1/ e cm). Either case clearly distinguishes gauge-sector CP violation from Higgs-sector CP violation which typically gives a neutron moment of order 10^{-24} e cm.

WEAK INTERACTIONS

REFER ALSO TO CITATION(S) 32934

32928 (BNL—27950) **Quark-diagram classification of charm decays.** Rizzo, T.G.; Wang, L.L. (Brookhaven National Lab., Upton, NY (USA)). May 1980. Contract AC02-76CH00016. 15p. (CONF-800724—6). NTIS, PC A02/MF A01.

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The decays of charm mesons are described in terms of quark-diagram amplitudes. Experimental implications of these amplitudes are also discussed.

32929 **Quantum-chromodynamic analysis of eN deep-inelastic scattering data.** Abbott, L.F.; Atwood, W.B.; Barnett, R.M. (Physics Department, Brandeis University, Waltham, Massachusetts 02154). DE-AC03-76SF00515;E(11-1)3230. *Phys. Rev., D;* **22**: No. 3, 582-593(1 Aug 1980).

In the context of quantum chromodynamics (QCD), an analysis is presented of a compilation of eN deep-inelastic scattering data taken at SLAC. Included are data for F/sup e/p_2, F/sup e/d_2, F/sup e/p_2-F/sup e/n_2, and R. The interaction between the logarithmic scaling violation from α_s and the power-law scaling violation from higher-twist terms is discussed. This interaction can affect the determination of the parameter Λ and can alter the predictions for the ratios of anomalous dimensions. Furthermore, we show that, in the context of QCD, higher-twist terms may be able to account for the observed value of $R = \sigma_L/\sigma_T$ which appears to be anomalously large. Different experiments have made different assumptions for the value of R used in extracting F_2 from their data. We show that these differences can account for the discrepancies in the relative normalizations of F_2 from these experiments and also can have a significant effect on the value of Λ obtained.

32930 **Decays of heavy Higgs bosons.** Rizzo, T.G. (Department of Physics, Brookhaven National Laboratory, Upton, New York 11973). DE-AC02-76CH00016. *Phys. Rev., D;* **22**: No. 3, 722-726(1 Aug 1980).

We consider the possible decay modes of a heavy Higgs boson in the mass range $M_W(\sim 80 \text{ GeV}) \leq M_H \leq 1$ TeV within the standard model of Weinberg and Salam. For $M_H > 2M_W, Z$ we find the decay modes $H \rightarrow W^+W^-$ or Z^0Z^0 to dominate the usual fermion-antifermion decay (f-barf); for $M_W, Z < M_H < 2M_W, Z$ we find the Higgs-boson width still dominated by f-barf although new decays such as $H \rightarrow W^{+-}$+f-barf' and $H \rightarrow Z^0$+f-barf are present. These new decay modes are significantly phase-space suppressed and are found to contribute with branching ratios less than 1%.

STRONG INTERACTIONS, BARYON NO.=0

32931 **Intuitive picture of the matrix elements of composite particles and the ratios of psi and psi' decays.** Huang, T.; He, Z. (Stanford Linear Accelerator Center, Stanford University, Stanford, California 94305). DE-AC03-76SF00515. *Phys. Rev., D;* **22**: No. 3, 744-750(1 Aug 1980).

In this paper we discuss the intuitive picture of the matrix element of composite particles, which has been represented in the field theory of composite particles. In addition, we discuss the ratio of psi and psi' particle decays under a reasonable assumption and obtain some interesting results.

32932 **Parton description of soft p-barp annihilation.** Sukhatme, U.P. (Department of Physics and Ames Laboratory: U.S. Department of Energy, Iowa State University, Ames, Iowa 50011). W-7405-ENG-82. *Phys. Rev. Lett.;* **45**: No. 1, 5-7(7 Jul 1980).

A parton description of soft, high-energy p-barp annihilation is presented in a three-chain model based on the dual topological unitarization scheme. With this model, full, quantitative, zero-parameter predictions are made for inclusive single-particle rapidity distributions and their energy dependence, which are testable in forthcoming p-barp experiments.

32933 **Meson structure functions from high—transverse-momentum hadron interactions.** Lai, K.; Thews, R.L. (Department of Physics, University of Arizona, Tucson, Arizona 85721). *Phys. Rev. Lett.;* **44**: No. 26, 1729-1733(30 Jun 1980).

Data on large—transverse-momentum π^0 production by proton, pion, and kaon beams is used to extract the large-x behavior of meson structure functions. Good agreement is found with the proton and pion quark distribution functions obtained from deep inelastic and dimuon production experiments. This study provides the first look at the kaon structure function. A significantly faster falloff is found as x approaches unity than for that of pions.

32934 **Can one measure strong corrections to weak decays?.** Eilam, G.; Leveille, J.P. (Physics Department, University of Wisconsin-Madison, Madison, Wisconsin 53706). EY-76-C-OZ-0881;COO-881-110. *Phys. Rev. Lett.;* **44**: No. 25, 1648-1652(23 Jun 1980).

It is found that some decays of bottom and top mesons, such as $B_s \rightarrow \phi\pi$, can proceed only via diagrams conjectured to play an important role in CP nonconservation, $\Delta I = 1/2$ dominance, and Cabibbo-suppressed charmed-meson decays. These new decays are estimated and predictions are presented for charmed-meson decays. All predictions depend crucially on the relative importance of certain strong corrections to weak process (penguins).

STRONG INTERACTIONS, BARYON NO.=1

32935 (LA-UR—80-2450) **Calculability of the n-p mass difference in gauge theories.** Kiskis, J. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 7p. (CONF-800724—13). NTIS, PC A02/MF A01.

From 20. international conference on high energy physics; Madison, WI, USA (17 Jul 1980).

The requirement of a calculable n-p mass difference leads to a consideration of unified gauge theories. Future developments in grand unified models may provide a realistic framework for the calculation of the n-p mass difference. The possibility that the relatively soft ultraviolet behavior of QCD softens the divergence in the lowest-order electromagnetic mass shift is considered in detail. It is shown that, if the bare mass and QCD coupling are constrained to be independent of the electromagnetic coupling, as is natural, then the lowest-order electromagnetic shifts of the renormalized mass and QCD coupling are infinite.

32936 Simple model of pion-nucleon elastic scattering. Ernst, D.J.; Johnson, M.B. (Physics Department, Texas A&M University, College Station, Texas 77843). *Phys. Rev., C;* **22**: No. 2, 651-663(Aug 1980).

A nonstatic model for elastic pion-nucleon scattering is developed using knowledge of the analytic structure of the scattering amplitude and partial wave N/D dispersion techniques. In S, D, and F partial wave channels the model is equivalent to a separable potential model which includes the coupling to inelastic channels. In P-wave channels the nucleon pole which arises from absorption and emission of the pion is included. A more general model which incorporates both a nucleon pole term and a separable potential term is developed for the P_{11} channel. This model is capable of reproducing the change of sign which is present in the P_{11} phase shifts. The necessary information concerning the coupling of the inelastic scattering to the elastic scattering is taken from the experimentally determined phase shifts as input. If simple kinematic factors are included explicitly, quite simple analytic functions for the form factors in the model are able to reproduce the experimental phase shifts for pion laboratory kinetic energies up to 1.2 GeV. The model produces off-shell behavior which is different from previous models. In particular, the inclusion of the nucleon pole alters substantially the range of the interaction in all P-wave channels.

STRONG INTERACTIONS, BARYON NO. GREATER THAN 1

32937 (DOE/ER/02972—5, pp 6-14) **Analysis of the singlet and triplet contributions to the total cross section differences Δ σ/sub T/ and Δ σ/sub L/ in p vector - p vector scattering between 1 and 3 GeV/c.** Jan 1980.

In Medium energy measurements of n-p parameters. Progress in research, January 1-December 31, 1979.

It is found that the structure observed in Δ sigma/sub T/ and Δ sigma/sub L/ between 1 and 2 GeV/c are due to increases in the singlet, triplet, and triplet interference cross sections that occur at different momenta. A separation into elastic and inelastic contributions to the singlet and triplet cross sections is proposed. 2 figures. (RWR)

PARTICLE INVARIANCE PRINCIPLES AND SYMMETRIES

GENERAL

REFER ALSO TO CITATION(S) 32940

APPLICATIONS TO ELECTROMAGNETIC AND WEAK INTERACTIONS

REFER ALSO TO CITATION(S) 32927

APPLICATIONS TO STRONG INTERACTIONS

32938 SU(5) theories with both proton stability and cosmological baryon-number generation. Segre, G.; Weldon, H.A. (Department of Physics, University of Pennsylvania, Philadelphia, Pennsylvania 19104). EY-76-C-02-3071. *Phys. Rev. Lett.;* **44**: No. 26, 1737-1740(30 Jun 1980).

It is shown how the addition of global U(1)/sub c/ of color to the conventional SU(5) model leads to a stable proton despite the nonconservation of baryon number. A stable, massive, neutral lepton is also predicted. The possibility that emerges of having relatively light mass (M> or ≈M/sub u/) color-triplet Higgs mesons modifies the gauge hierarchy problem and leads to cosmological baryon-number generation at low temperatures (kT≈100 GeV).

FIELD THEORY

REFER ALSO TO CITATION(S) 32926, 32929, 32931, 32935, 32938

32939 Magnetic monopoles in grand unified theories. Langacker, P.; Pi, S. (Institute for Advanced Study, Princeton, New Jersey 08540). EY-76-C-02-0371;DE-AC03-765F00515. *Phys. Rev. Lett.;* **45**: No. 1, 1-4(7 Jul 1980).

It is suggested that the magnetic monopoles predicted by grand unified theories would not be produced in significant numbers if electromagnetic gauge invariance is spontaneously broken when the temperature T is greater than T/sub c/> or ≈1 TeV. A model possessing this behavior is displayed and the cosmological implications are discussed.

32940 Order-R vacuum action functional in scalar-free unified theories with spontaneous scale breaking. Adler, S.L. (The Institute for Advanced Study, Princeton, New Jersey 08540). DE-AC02-76ER02220. *Phys. Rev. Lett.;* **44**: No. 24, 1567-1569(16 Jun 1980).

It is shown that in unified theories containing only fermions and gauge fields and in which scale invariance is spontaneously broken, radiative corrections induce an order-R term in the vacuum action functional which is uniquely determined by the flat—space-time theory.

32941 Choosing an expansion parameter for quantum chromodynamics. Abbott, L.F. (Department of Physics, Brandeis University, Waltham, Massachusetts 02254). E(11-1)3230. *Phys. Rev. Lett.;* **44**: No. 24, 1569-1572(16 Jun 1980).

When expanded in powers of alpha-bar where alpha-bar is chosen to satisfy alpha-bar(Q_0^2)=$4\pi/\beta_0 \ln(Q_0^2/\Lambda^2)$ =α/sub M/S-bar(Q_0^2) with $Q_0^2 \gg 10$ GeV², the quantum chromodynamics (QCD) perturbation series seems to be extremely well behaved. In particular, the large third-order corrections discussed recently by Moshe do not appear when this alpha-bar is used as the QCD expansion parameter.

32942 Relativistic theory of parity violation in many-electron atoms. Hiller, J.; Sucher, J.; Feinberg, G.; Lynn, B. (Department of Physics and Astronomy, University of Maryland, College Park, Maryland 20742). *Ann. Phys. (N.Y.);* **127**: No. 1, 149-178(Jun 1980).

We present a theoretical framework for the calculation of parity-mixing effects of the weak interaction in many-electron atoms which is based on first principles. The starting point is an external-field no-pair Hamiltonian H/sub +/ which allows for a consistent treatment of effects coming from virtual electron—positron pairs and can be used as a basis for a systematic program of calculations. We show that the matrix element M for parity-violating E1 transitions, given by quantum electrodynamics, gets an appreciable contribution M/sup pair/ from states involving an extra electron—position pair. However on liminating the velocity operator α in favor of the length operator iωr, we find cancellations which result in an accurate formula for M involving only the positive-energy N-electron eigenstates of H/sub +/ as intermediate states and the length forms, iωrxε, of the dipole operator. We discuss the implications of our results for calculations of amplitudes for parity-violating radiative E1 transitions in many-electron atoms. Our analysis includes a study of the effects coming from the weak electron—electron interactions as well as those arising from the weak electron—nucleus interactions.

PHYSICS RESEARCH

NUCLEAR PHYSICS

32943 (DOE/ER/03624—20) **North Carolina State University nuclear structure research at the Triangle Universities Nuclear Laboratory. Progress report, 1 April 1979-31 March 1980.** Gould, C.R.; Mitchell, G.E.; Seagondollar, L.W.; Tilley, D.R. (North Carolina State Univ., Raleigh (USA)). 1 Feb 1980. Contract EY-76-S-05-3624. 94p. NTIS, PC A05/MF A01.

Research during the period April 1, 1979 to March 31, 1980 is reported in the following areas: neutron cross section experiments, high-resolution studies, radiative capture reactions, atomic physics, and nuclear theory and phenomenology. Other activities, including accelerator development and instrumentation and developments related to computers, are also sketched. The body of this report is a photocopy of that portion of the TUNL Annual Report XVIII in which NCSU personnel were involved. The TUNL Annual Report XVIII (see DOE/TIC—11133 in the Report Number Index) is indexed in greater depth. (RWR)

32944 (DOE/ER/10364—13) **Research in theoretical nuclear physics. Progress report and research proposal, 1980-1981.** Bayman, B.F.; Ellis, P.J.; Tang, Y.C. (Minnesota Univ., Minneapolis (USA). School of Physics and Astronomy). 1 Sep 1980. Contract AC02-79ER10364. 26p. NTIS, PC A03/MF A01.

Research performed during 1980 (and proposed for 1981) is summarized briefly in this administrative report. The main theme of the research is the mechanisms of light- and heavy-ion nuclear reactions and the relation between microscopic theories and phenomenological models. A publication list and budget are included. (RWR)

32945 (DOE/TIC—11133) **Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979.** (Duke Univ., Durham, NC (USA); North Carolina Univ., Chapel Hill (USA); North Carolina State Univ., Raleigh (USA)). 1979. Contract EY-76-S-05-3624;EY-76-S-05-2408;EY-76-S-05-3665. 118p. NTIS, PC A06/MF A01.

Activities during the year 1979 are reported in the following categories: neutron cross section experiments, neutron polarization

studies, high-resolution studies, charged-particle reactions with polarized beams, radiative capture reactions, atomic physics, other experiments, work done elsewhere by TUNL personnel, applications, ion source development, accelerator development and instrumentation, computer-related development, ad nuclear theory and phenomenology. Appendixes give lists of journal publications, talks, etc. Twelve of the contributions to this annual report have been abstracted and indexed individually. (RWR)

32946 (LA—8298-PR) **Applied nuclear data research and development. Progress report, October 1-December 31, 1979.** Baxman, C.I.; Young, P.G. (comps.). (Los Alamos Scientific Lab., NM (USA)). Mar 1980. Contract W-7405-ENG-36. 31p. NTIS, PC A03/MF A01.

This report describes the activities of the Los Alamos Nuclear Data Group for the period October 1 through December 31, 1979, in the following areas: theory and evaluation of nuclear cross sections; nuclear cross section processing; and fission product and actinides: yields, decay data, depletion, and buildup. Sections containing significant amounts of data are abstracted and indexed individually. 7 figures, 9 tables. (RWR)

32947 (LA—8335-C(Vol.2)) **Proceedings of the Workshop on Program Options in Intermediate-Energy Physics. Keynote address: New directions in intermediate-energy nuclear physics .** Brown, G.E. (Los Alamos Scientific Lab., NM (USA)). May 1980. Contract W-7405-ENG-36. 19p. (CONF-7908121—1(Vol.2)). NTIS, PC A02/MF A01.

From Workshop on program options in intermediate-energy physics; Los Alamos, NM, USA (20 Aug 1979).

This report presents the keynote address given by G.E. Brown at a LASL colloquium on August 21, 1979, for the Workshop on Program Options in Intermediate-Energy Physics. Professor Brown reviewed major topics of interest in intermediate-energy nuclear physics and suggested experimental approaches that might be most productive in the near future. 22 figures.

32948 (LA—8418-PR) **Applied nuclear data research and development. Progress report, January 1-March 31, 1980.** Baxman, C.I.; Young, P.G. (comps.). (Los Alamos Scientific Lab., NM (USA)). Jun 1980. Contract W-7405-ENG-36. 38p. NTIS, PC A03/MF A01.

Activities of the Los Alamos Nuclear Data Group for the period January 1, 1980 through March 31, 1980 are described. The work fell into three principal categories: theory and evaluation of nuclear cross sections; nuclear cross section processing, and fission products and actinides: yields, decay data, depletion, and buildup. Individual abstracts were prepared for two of the sections in this report. 25 figures, 16 tables.

32949 (UCID—17271-80) **E-Divisionn activities report.** Barschall, H.H. (comp.). (California Univ., Livermore (USA). Lawrence Livermore Lab.). Jul 1980. Contract W-7405-ENG-48. 48p. NTIS, PC A03/MF A01.

This report describes some of the activities in E (Experimental Physics) Division during the past year. E-Division carries out research and development in areas related to the missions of the Laboratory. Many of the activities are in pure and applied atomic and nuclear physics. In addition this report describes work on accelerators, radiation damage, microwaves, and plasma diagnostics.

EXPERIMENTAL TECHNIQUES

REFER ALSO TO CITATION(S) 33013, 33018

32950 (ANL/PHY—79-4, pp 55-75) **Entry region studies by means of sumspectrometer and multiplicity techniques.** Hagemann, G.B. (Univ. of Copenhagen, Denmark). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

General trends in the decays preceeding the yrast individually observable transitions are discussed. The basic parameters in the search for trends in the Γ-decay pattern after population of the final nucleus in a heavy ion-induced compound reaction are the excitation energy and angular momentum. The experimental possibility of both determining these parameters for the entry region in the final nuclei and also selecting specific regions of the entry population for studying the decays in more detail is provided by use of a sum spectrometer combined with other detectors. The technique of extracting moments of Γ-ray multiplicity distributions from multicounter arrays is summarized. This technique is illustrated for spectra from the reaction $^{50}Ti + {}^{50}Ti \rightarrow {}^{100}Ru$ at 192 MeV. 10 figures, 1 table. (RWR)

32951 (ANL/PHY—79-4, pp 223-254) **Determination of B(E2)-values between high spin states from Coulomb excitation and HI, XN-reactions.** Grosse, E. (GSI Darmstadt, Germany). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

Reasons to measure B(E2) values at high spins are discussed first. Then three methods of determining B(E2) values between high-spin states (Coulomb excitation, recoil distance experiments, and Doppler shift attenuation measurements) are described and first results are given. Relative transition strengths are shown for ^{158}Dy, ^{164}Dy, and ^{238}U. 17 figures. (RWR)

NUCLEAR PROPERTIES AND REACTIONS, A=1-5, THEORETICAL

MASS, ABUNDANCE, AND BINDING ENERGY

32952 **Retardation, quasipotential equations, and relativistic corrections to the deuteron charge operator.** Friar, J.L. (Theoretical Division, Los Alamos Scientific Laboratory, University of California, Los Alamos, New Mexico 87545). *Phys. Rev., C;* **22**: No. 2, 796-812(Aug 1980).

Four different methods for handling the retardation of a single meson exchange in the nuclear force have been examined, together with the corresponding contributions to the deuteron charge operator. It is shown that to order $(v/c)^2$ these operators are all part of a single unitarily equivalent family. The Gross quasipotential equation is examined and relativistic corrections to the deuteron charge form factor are shown to be the same as those generated by the author's method, when converted to a common unitary representation. The same result has also been demonstrated for the folded diagram method. The asymmetric terms in Gross's Hamiltonian are shown to take the place of recoil graph contributions to the charge operator. These terms are necessary for Lorentz invariance and the "Gross correction" to the deuteron charge form factor.

ENERGY LEVELS AND TRANSITIONS

32953 **Configuration space Faddeev calculations. I. Triton ground-state properties.** Payne, G.L.; Friar, J.L.; Gibson, B.F.; Afnan, I.R. (Department of Physics and Astronomy, University of Iowa, Iowa City, Iowa 52242). *Phys. Rev., C;* **22**: No. 2, 823-831(Aug 1980).

The formulation of Faddeev-type equations in configuration space is discussed. Numerical solutions are obtained using splines and the method of orthogonal collocation. Triton observables and wavefunction probabilities are calculated for s-wave NN interaction models of Malfliet and Tjon and the tensor force model of Reid. Comparison with previously published triton results is made; our full five-channel results for the Reid soft-core potential are in excellent agreement with those obtained by Afnan and Birrell using separable expansion methods.

32954 **Configuration space Faddeev calculations. II. Trinucleon Coulomb energy.** Payne, G.L.; Friar, J.L.; Gibson, B.F. (Department of Physics and Astronomy, University of Iowa, Iowa City, Iowa 52242). *Phys. Rev., C;* **22**: No. 2, 832-841(Aug 1980).

Coordinate space Faddeev techniques and a variety of potentials are used to calculate energies and wave functions for the trinucleon system, both with and without a static Coulomb interaction between the two protons. The wave functions are used to calculate first- and second-order perturbation theory contributions to the Coulomb energy of ^3He. Because too few partial-wave components of the potential are kept, the energy eigenvalues themselves are an inaccurate gauge of the Coulomb effect. The approximate hyperspherical formula was tested after calculating charge densities and found to be accurate to better than 2 percent. It is demonstrated that when using a phenomenological approach to the ^3He Coulomb energy, the second-order contribution increases the Coulomb energy by roughly 4 +- 1 keV. Finally, sum rules relating to the T=3/2 state probability and the size of the second-order contribution are discussed.

NUCLEAR REACTIONS AND SCATTERING

32955 (LA—8298-PR, pp 1-3) **Low-energy behavior of fusion cross sections.** Hale, G.M.; Dodder, D.C. Mar 1980.

In Applied nuclear data research and development. Progress report, October 1-December 31, 1979.

Astrophysical S functions were calculated for the reactions $T(d,n)^4He$ and $D(d,n)^3He$ in the region below 50 keV. It is clear that these S functions do not behave as constants. 2 figures (RWR)

32956 **Comments on two tests of partial conservation of axial vector current in ^3He.** Goldstein, W. (Physics Department, Columbia University, New York, New York 10027). *Phys. Rev., C;* **22**: No. 2, 901-906(Aug 1980).

Another look is taken at the transition amplitude for radiative muon capture. We conclude that the standard, or diagrammatic, amplitude first given by Opat for hydrogen is a good approximation to the systematic expansion of Adler and Dothan, and use it to calculate the angle-integrated photon spectrum in $^3He\mu^- \rightarrow {}^3H\gamma\nu$.

The result is in fair agreement with Beder and Fearing. Also, the "soft-pion" prediction for $^3He\pi^- \rightarrow {}^3H\gamma$ is compared with experimental data.

NUCLEAR PROPERTIES AND REACTIONS, A=1-5, EXPERIMENTAL

NUCLEAR REACTIONS AND SCATTERING

32957 (DOE/ER/02972—5, pp 27-39) **Measurement of the polarization transfer coefficients D/sub t/ and A/sub t/' at 800 MeV for the reactions ^{2}H(p vector, n vector)X ^{1}H(p vector, n vector)X and ^{9}Be(p vector, n vector)X.** Jan 1980.

In Medium energy measurements of n-p parameters. Progress in research, January 1-December 31, 1979.

Experimental details including transport of the polarized beam are discussed at some length. Outgoing neutron polarization was measured with a liquid hydrogen radiator and multiwire proportional chamber spectrometer. Experimental results for D/sub t/(0°) for deuterium and hydrogen are shown from 700 to 1500 MeV/c. On-line analysis of the high-momentum neutron peak yielded A/sub t/' = 0.57 +- 0.02, 0.44 +- 0.04, and 0.50 +- 0.04 for ^{2}H, ^{9}Be, and ^{6}Li, respectively. Estimate for ^{1}H are given. 6 figures. (RWR)

32958 (DOE/TIC—11133, pp 64-68) **Study of the ^{3}H(p,γ)^{4}He reaction.** Manglos, S.; McBroom, D.; Weller, H.R.; Roberson, N.R.; Wender, S.A.; Tilley, D.R. 1979.

In Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979.

Fore-aft asymmetry results are plotted from 35 to 44 MeV in excitation. A sample γ spectrum from a bombardment at 29.0 MeV is also shown. 2 figures. (RWR)

32959 (DOE/TIC—11133, pp 79-82) **^{3}He(n,γ)^{4}He reaction.** Ward, L.; Tilley, D.R.; Roberson, N.R.; Wender, S.A.; Skopik, D.; Weller, H.R. 1979.

In Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979.

A typical NaI pulse height spectrum taken at 9.0 MeV is shown. Preliminary cross section data are presented after conversion to ^{4}He(γ,n) cross sections for the range E/sub x/ = 24 to 32 MeV. 2 figures. (RWR)

32960 (LA—8407-PR, pp 26-28) **Measurement of the ^{3}He(π^-,π^0)^{3}H angular distribution.** Jun 1980.

In Medium-energy physics program. Progress report, August 1-October 31, 1979.

Energy spectra and angular distributions are shown for an incident energy of 200 MeV. The ratio of the analog state to the continuum decreases as the angle increases. 3 figures. (RWR)

32961 (LA—8407-PR, pp 39-40) **Study of pion absorption mechanisms.** Jun 1980.

In Medium-energy physics program. Progress report, August 1-October 31, 1979.

High-energy proton spectra from π^+ + ^{4}He reactions are shown at 30° for energies ranging from 60 to 220 MeV and at 160 MeV for angles ranging from 30° to 150°. Proton spectra for 220-MeV π^+ at 30° are also shown for Li, Be, and C targets; the A dependence of the cross section is plotted. 4 figures. (RWR)

32962 **Neutron total cross section for tritium.** Phillips, T.W.; Berman, B.L.; Seagrave, J.D. (Lawrence Livermore Laboratory, University of California, Livermore, California 94550). *Phys. Rev., C;* **22**: No. 2, 384-396(Aug 1980).

The neutron total cross sections for hydrogen, deuterium, and tritium have been measured with the neutron-time-of-flight technique. The tritium data span the neutron energy range from 60 keV to 80 MeV, with an overall systematic uncertainty which varies from 0.5% for energies below 17 MeV to 2% at the highest energy measured; the statistical uncertainties exceed these values only below 200 keV and above 7 MeV. The three-mole high-pressure gas samples were nearly isotopically pure. Excellent agreement is found with accepted cross sections for hydrogen and deuterium, and with previous Van de Graaff measurements for tritium except at the lowest-energy point at 290 keV. A minimum in the cross section near 600 keV (with a rise at lower energy) is newly observed. The cross section in the heretofore unexplored energy region between 7 and 14 MeV exhibits no structure, and thus no evidence for the existence of a bound four-neutron state. The extrapolated zero-energy cross section is found to be 1.70 +- 0.03 b, in sharp disagreement with previous thermal-energy observations, but in agreement with calculations which also yield the currently accepted coherent scattering length 3.73 fm. Agreement with a prediction from an analysis of p-^{3}He data is within 1% at the resonance peak near 3.5 MeV, but the data differ from this prediction by as much as 6% at lower and higher energies. Thus, within the framework of a suitable theoretical analysis, the present data might provide a measure of the departure from charge symmetry of the nuclear force.

NUCLEAR PROPERTIES AND REACTIONS, A=6-19 THEORETICAL

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 32973, 33047

32963 **Gamow-Teller matrix elements from 0° (p,n) cross section.** Goodman, C.D.; Goulding, C.A.; Greenfield, M.B.; Rapaport, J.; Bainum, D.E.; Foster, C.C.; Love, W.G.; Petrovich, F. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). W-7405-ENG-26. *Phys. Rev. Lett.;* **44**: No. 26, 1755-1759(30 Jun 1980).

After simple corrections for distortion effects, 120-MeV, 0° (p,n) cross sections are found to be proportional to the squares of the corresponding Fermi and Gamow-Teller matrix elements extracted from β-decay measurements. It is suggested that this proportionality can be used to extract Gamow-Teller matrix elements for transitions inaccessible to β decay.

32964 **Do quasifree reaction mechanisms explain reaction cross sections in intermediate-energy proton-nucleus scattering?.** Alexander, Y.; Van Orden, J.W.; Redish, E.F.; Wallace, S.J. (Racah Institute of Physics, Hebrew University, Jerusalem, Israel). *Phys. Rev. Lett.;* **44**: No. 24, 1579-1582(16 Jun 1980).

The 800-MeV (p,p') inclusive proton spectra at forward angles are considered. A plane-wave impulse approximation is used to calculate quasifree nucleon knockout and quasifree isobar production. When the quasifree peaks are normalized to data, we find that the integrated cross section for the two processes can account for the total reaction cross section.

NUCLEAR PROPERTIES AND REACTIONS, A=6-19, EXPERIMENTAL

RADIOACTIVE DECAY

32965 **Beta-alpha angular correlations in mass 8.** McKeown, R.D.; Garvey, G.T.; Gagliardi, C.A. (Argonne National Laboratory, Argonne, Illinois 60439). W-31-109-ENG-38. *Phys. Rev., C;* **22**: No. 2, 738-749(Aug 1980).

A detailed study of the β^{-+}-α angular correlations in the ^{8}Li(β^-) and ^{8}B(β^+) decays was performed. Since these decays proceed to the 2α continuum, detection of both alpha particles enabled determination of various correlations as functions of the final-state energy. The experimental results show a small (≃ 15% of weak magnetism) deviation from the conserved vector current prediction which is dependent on the final-state energy. An effect of this size cannot be interpreted as convincing evidence for the presence of second-class currents or a breakdown of conserved vector current theory. However, the inclusion of the vector second-forbidden terms in the nuclear weak current as predicted by the conserved vector current theory is crucial to obtain even approximate agreement with the experimental results.

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 32957, 32961, 32973, 32998

32966 (DOE/TIC—11133, pp 5-11) **Elastic and inelastic scattering of 7- to 14-MeV neutron from ^{6}Li and ^{7}Li.** 1979.

In Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979.

The spherical optical model was used to study experimetal data taken earlier. Resulting potential parameters and fits are shown, along with coupled-channels fits to ^{11}B data. 6 figures, 3 tables. (RWR)

32967 (DOE/TIC—11133, pp 22-25) **Scattering of polarized neutrons from ^{9}Be.** Floyd, C.; Guss, P.; Murphy, R.K.; Byrd, R.; Wender, S.; Clegg, T.; Walter, R.L. 1979.

In Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979.

The analyzing power extracted from scattering of polarized neutrons with energies from 9.0 to 15.0 MeV is shown. 21 figures. (RWR)

32968 (DOE/TIC—11133, pp 31-32) **Comparisons of polarizations and analyzing powers for the ^{13}C(p,n$_0$)^{13}N reaction at 6.88 MeV.** Guss, P.P.; Byrd, R.C.; Floyd, C.E.; Murphy, R.K.; Clegg, T.B.; Walter, R.L.; Wender, S.A.; Wylie, W.R. 1979.

In Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979.

Analyzing power results A/sup y/(theta) are compared with P/sub y/(theta) measurements of other workers. The differences between the data sets are sizable enough to suggest a difference between P/sup y/ and A/sup y/ in the $^{13}C(p,n_0)^{13}N$ reaction. 1 figure. (RWR)

32969 (DOE/TIC—11133, pp 32-33) **Measurement of the $^{9}Be(p,n)^{9}B$ differential cross section.** Byrd, R.C.; Floyd, C.E.; Murphy, R.K.; Guss, P.P.; Walter, R.L. 1979.

In Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979.

Complete angular distributions are presented for energies from 8.0 to 15.7 MeV. The integrated cross section is plotted as a function of energy over the same range. 2 figures. (RWR)

32970 (DOE/TIC—11133, pp 33-34) **Differential cross section for the $^{13}C(p,n)^{13}N$ reaction.** 1979.

In Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979.

Complete angular distributions are shown from 9.9 to 16.75 MeV. Legendre polynomial fits are also plotted. 1 figure. (RWR)

32971 (DOE/TIC—11133, pp 82-84) **$^{13}C(n\ vector,\gamma_0)^{14}C$ reaction.** Jensen, M.J.; Ward, L.W.; Tilley, D.R.; Wender, S.A.; Roberson, N.R.; Weller, H.R.; Clegg, T.B. 1979.

In Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979.

The excitation function for the $^{13}C(n\gamma_0)$ reaction with polarized neutrons is shown from 5.6 to 14.0 MeV. Angular distributions of cross sections and analyzing power are presented for incident energies of 7.75 and 10.2 MeV. 2 figures. (RWR)

32972 (LA—8231-T) **Elastic and inelastic scattering of pions from oxygen-16.** Holtkamp, D.B. (Los Alamos Scientific Lab., NM (USA)). Feb 1980. Contract W-7405-ENG-36. 203p. NTIS, PC A10/MF A01.

Thesis.

Positive and negative pions of an energy of 164 MeV were used in a scattering experiment at EPICS in a study of the atomic nucleus of ^{16}O. Angular distributions for the ground state and several excited states are presented for an angular range of 45° to 89° (lab). Of particular importance in this study is the observation of large asymmetries in the ratio $\sigma(\pi^+)/\sigma(\pi^-)$ for excitations of particle-hole states at 17.79 MeV (4⁻,0) and 19.80 MeV (4⁻,0), while the ratio for scattering to the state at 18.98 MeV (4⁻,1) is unity. These results are interpreted in terms of isospin mixing among these three states, yielding off-diagonal charge dependent mixing matrix elements of 188 +- 29 keV and 140 +- 21 keV. DWIA calculations using collective form factors yield deformation lengths in agreement with studies using other probes. Microscopic DWIA calculations for the 4^- states are also presented, which reproduce the π^+/π^- ratios well be reflect the shape of the angular distributions poorly.

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 33043

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 32963, 32983

NUCLEAR PROPERTIES AND REACTIONS, A=20-38, EXPERIMENTAL

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 32973, 32974

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 32998

32973 (DOE/TIC—11133, pp 50-56) **Isospin forbidden T = 3/2 resonances.** Wilkerson, J.F.; Ludwig, E.J.; Clegg, T.B.; Thompson, W.J. 1979.

In Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979.

Cross section and analyzing power data were taken for the first and third T = 3/2 states in ^{33}Cl by polarized proton elastic scattering by ^{32}S. Resonance widths were extracted. In addition, cross section data are shown for unpolarized proton scattering by ^{41}O near 11.26 MeV. A theoretical prediction of the analyzing power of $^{12}C(p,p)$ is made for the region 14.225 to 14.240 MeV. 5 figures. (RWR)

32974 **Inelastic electron scattering from ^{29}Si.** Whitner, K.E.; Williamson, C.F.; Norum, B.E.; Kowalski, S. (Bates Linear Accelerator Center and Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). EY-76-C-02-3069. *Phys. Rev., C;* **22**: No. 2, 374-383(Aug 1980).

Electron scattering from ^{28}Si and ^{29}Si has been performed at energies from 126 to 293 MeV and at angles of 45° and 90°. Form factors were extracted for levels below 5.0 MeV in ^{28}Si and ^{29}Si over an effective momentum transfer range of 0.6 to 2.1 fm^{-1}. A particle-phonon coupling calculation using harmonic-oscillator single-particle states and data from ^{28}Si give a reasonable description of the low-lying states of ^{29}Si.

NUCLEAR PROPERTIES AND REACTIONS, A=39-58, THEORETICAL

NUCLEAR REACTIONS AND SCATTERING

32975 **Elastic and inelastic scattering of ^{6}Li at about 74 MeV and the folding model.** Satchler, G.R. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). W-7405-ENG-26. *Phys. Rev., C;* **22**: No. 2, 919-921(Aug 1980).

The data for the elastic scattering of ^{6}Li at 73.7 MeV from ^{58}Ni, ^{90}Zr, ^{124}Sn, and ^{208}Pb have been fitted using the M3Y effective interaction and the folding model for the real potential. The results confirm that the renormalization of this interaction by about 0.6 needed to fit data at lower energies is required here also. Comparison with data for the inelastic scattering from ^{58}Ni at 71 MeV shows them to be consistent with folding model predictions using the same renormalization, but the dominance of the imaginary coupling makes more detailed conclusions difficult.

NUCLEAR PROPERTIES AND REACTIONS, A=39-58, EXPERIMENTAL

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 32950

32976 (ANL/PHY—79-4, pp 495-502) **Gamma-ray spectroscopy of high-spin states in deep-inelastic reactions.** Trautmann, W.; Duennweber, W.; Hering, W.; Lauterbach, C.; Puchta, H. (Univ. of Munich, Germany). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The mechanism of 96-MeV ^{16}O + ^{48}Ti deep-inelastic reactions was studied by measurement of the yields and angular distributions of discrete γ transitions in coincidence with the light fragments. The Ge(Li) spectra show that high-spin yrast states are populated in the decay of the heavy fragments with a selectivity so far known only from fusion reactions. The observations demonstrate the two-body character of the ^{16}O + ^{48}Ti reaction. The yields per Z = 6 fragment of transitions in ^{50}Cr are shown for several Q windows. The anisotropies for stretched E2 cascades in the two cases of a net transfer of no particle (Z = 8, ^{46}Ti) and of a net α-particle transfer (Z = 6, 50Cr) are compared and disucssed. 4 figures. (RWR)

32977 (DOE/TIC—11133, pp 17-19) **Elastic scattering of 8-, 10- and 12 MeV neutrons from ^{54}Fe, ^{56}Fe, ^{63}Cu and ^{65}Cu.** 1979.

In Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979.

Results of an optical-model analysis of the data on ^{56}Fe and ^{63}Cu are shown and discussed. 4 figures. (RWR)

32978 (DOE/TIC—11133, pp 25-26) **Analyzing power and cross sections for $^{40}Ca(n,n)$.** Tornow, W.; Woye, E.; Mack, G.; Floyd, C.; Murphy, R.K.; Guss, P.; Byrd, R.; Wender, S.; Clegg, T.; Walter, R. 1979.

In Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979.

The analyzing power for scattering at 10, 12, and 14 MeV is shown. 1 figure. (RWR)

NUCLEAR PROPERTIES AND REACTIONS, A=59-89, THEORETICAL

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 33041

NUCLEAR REACTIONS AND SCATTERING

32979 (LA—8418-PR, pp 2-6) **Calculation of neutron cross sections on excited targets.** Arthur, E.D. Jun 1980.

In Applied nuclear data research and development. Progress report, January 1-March 31, 1980.

Cross sections for neutron reactions on Y targets existing in excited states were calculated for incident energies between 1 keV and 20 MeV. Such cross sections can be very different from those of ground-state targets. Results are shown for (n,2n), (n,p), and capture reactions on excited-state ^{88}Y. 3 figures, 1 table. (RWR)

32980 (p,n) reaction for 89<A<130 and an anomalous optical model potential for sub-Coulomb protons. Johnson, C.H. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). *Phys. Rev., C;* **22**: No. 2, 899-900(Aug 1980).

Lagrange's optical model analysis, which includes not only sub-Coulomb proton absorption cross sections but also neutron data and other proton data, adds insight into the anomalous behavior of the sub-Coulomb protons but does not explain all of the anomaly.

NUCLEAR PROPERTIES AND REACTIONS, A=59-89, EXPERIMENTAL

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 32985

32981 (ANL/PHY—79-4, pp 357-362) **High spin states in the A = 80 region.** Medsker, L.R.; Clements, J.S.; Fry, L.H. Jr.; Theisen, L.V. (Florida State Univ., Tallahassee). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The (HI, Xγ) reaction was used to study high-spin states in ^{79}Rb. Spins and parities are suggested. Level systematics in this mass region are discussed with the aid of published data. 4 figures. (RWR)

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 32977, 32998

32982 (ANL/NDM—54) **Nonelastic-scattering cross sections of elemental nickel.** Smith, A.B.; Guenther, P.T.; Whalen, J.F. (Argonne National Lab., IL (USA)). Jun 1980. Contract W-31-109-ENG-38. 24p. NTIS, PC A02/MF A01.

Neutron total cross sections of elemental nickel were measured from 1.3 to 4.5 MeV, at intervals of ~ 50 keV, with resolutions of 30 to 50 keV and to accuracies of 1 to 2.5%. Neutron differential-elastic-scattering cross sections were measured from 1.45 to 3.8 MeV, at intervals and with resolutions comparable to those of the total cross sections, and to accuracies of 3 to 5%. The nonelastic-scattering cross section is derived from the measured values to accuracies of ≧ 6%. The experimental results are compared with previously reported values as represented by ENDF/B-V, and areas of consistency and discrepancy, noted. The measured results are shown to be in good agreement with the predictions of a model previously reported by the authors. 4 figures, 1 table.

32983 (COO—4721-2) **Experimental nuclear and radiochemistry. Progress report, February 1, 1979-January 31, 1980.** Karol, P.J. (Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Chemistry). 1980. Contract ER-78-S-02-4721. 35p. NTIS, PC A03/MF A01.

This project entails the investigation of deep nuclear spallation reactions induced by high-energy light particles on complex nuclei. Experimental studies involve activation of various medium-to heavy-mass targets bombarded by pi mesons, protons, and alpha particles. A prime objective is to deconvolve the cascade and evaporation steps in the reaction mechanism. Experimentally, then, particular emphasis has been placed on spallation products far from yield maxima. Irradiations have been performed predominantly at the Clinton P. Anderson Los Alamos Meson Physics Facility. Results from bombardments of ^{89}Y with 190-MeV π^-, 800-MeV protons and 720-MeV alphas (SREL) have been nearly completed; mass-yield distributions were compared. Pion-induced neutron removal reactions have been presented for ^{90}Zr and ^{96}Ru along with a serious critique of the final-state charge interaction hypothesis. Theoretical efforts are being directed at the evaporative behavior of very high-temperature nuclei as determined by the nuclear equation of state and how such behavior might become evident in spallation processes. In addition, the soft spheres model has been extended to consider the significance of nuclear transparency in high-energy reactions.

32984 (DOE/TIC—11133, pp 36-40) **High resolution elastic scattering.** Bilpuch, E.G.; Mitchell, G.E.; Dubendorff, B.; Nelson, R.O.; Sales, K.B.; Watson, W.A.; Westerfeldt, C.R. 1979.

In Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979.

The differential cross section for ^{66}Zn(p,p) was measured at 2.60 to 3.26 MeV. Analysis yield 102 s-wave and 46 p-wave resonances. The proton strength function for l = 1 and l = 0 resonances is shown. 1 figure. (RWR)

32985 Octupole modes of oscillation via analyzing power measurements. Ardouin, D.; Brown, R.E.; Cizewski, J.A.; Flynn, E.R.; Sunier, J.W.; Alford, P.; Sugarbaker, E. (University of Nantes, Nantes, France). *Phys. Rev., C;* **22**: No. 2, 432-435(Aug 1980).

Measurements of the analyzing power in the two-nucleon transfer reactions /sup 70,72/Ge(t,p) have been carried out. This is a region where a shape transition has been previously proposed. Contrary to recent (p,t) results, no strong interference effects between direct and two-step processes leading to the 2^+_1 states have been observed. However, a marked difference has been revealed for the 3^-_1 octupole transition. A microscopic interpretation of this effect is proposed.

NUCLEAR PROPERTIES AND REACTIONS, A=90-149, THEORETICAL

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 32987, 33001

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 32963, 32975, 32980

32986 (ANL/PHY—79-4, pp 571-578) **Populations of high spin states in ^{152}Dy.** Wakai, M.; Sano, M. (Osaka Univ., Toyonaka, Japan). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The population of ^{152}Dy yrast states in compound-nucleus reactions was analyzed. Assumptions of the analysis are set forth. The calculated population of yrast states in the ^{124}Sn(^{32}S, 4nγ) reaction at 140 MeV is plotted as a function of the angular momentum. The theoretical values of the distributions of energy of emitted continuum γ-rays with E1, M1, and E2 multipolarities are shown as a function of γ energy. 2 figures. (RWR)

32987 Anomalous optical potential for sub-Coulomb barrier protons. Grimes, S.M. (Lawrence Livermore Laboratory, University of California, Livermore, California 94550). *Phys. Rev., C;* **22**: No. 2, 436-439(Aug 1980).

Measurements of the (p,n) cross section on targets near A=100 have been previously shown to require a rapid change in the imaginary potential with A. Two possible explanations of this behavior are examined. Since the large values for the absorption are found midway between closed shells, it is possible that either collective effects or a modulation of the density of intermediate states could provide the explanation for this result. Calculations which explicitly include the collective states are presented, as are calculations of the two-particle one-hole state densities in these nuclei. We conclude that both effects play some role in explaining the "anomaly."

NUCLEAR PROPERTIES AND REACTIONS, A=90-149, EXPERIMENTAL

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 32999, 33000, 33013

32988 (ANL/PHY—79-4, pp 125-153) **Z=64 shell closure and its implications for the yrast isomers in ths A=150 region.** Kleinheinz, P. (Kernforschungsanlage, Julich, Germany). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

Recent spectroscopic results on the energy levels of ^{146}Gd are discussed first; these relate to the shell closure at Z=64, viz the properties of the 3^- and 2^+ excitations, as well as the particle-hole yrast state energies, which are in good agreement with theoretical level energies. It appears that the ^{148}Gd yrast levels up to I = 16 are proton particle-hole excitations, which can be understood from the single-particle energy levels aroung Z = 64 and N = 82. The high-spin spectra of the adjacent nuclei ^{147}Gd and ^{147}Tb were then examined; both show the characteristic features of one-particle nuclei. For ^{147}Tb, the level energies can be calculated by use of empirical one- and two-nucleon interactions; for ^{147}Gd such a calculation is so far not possible. The study of the two-particle nuclei ^{144}Sm, ^{148}Gd, and ^{148}Dy provided useful structural information on the yrast lines in the A = 150 region, viz the frequent occurrence of two close-lying levels with equal spin and parity, the more than 2 MeV νi/sub 13/2/ to νf/sub 7/2/ single-particle energy separation, and the low excitation energy of the $(\pi h_{11/2}{}^2)_{10}+$ state in the Dy

nuclei. Whereas the proton effective charge as measured in ^{146}Gd and ^{148}Dy has about the expected size of 1.5 e, a first result for the neutron effective charge extracted from the $16^+ \rightarrow 14^+$ transition in ^{150}Dy gave the unexpectedly large value of e/sub eff/ = 3.6 e. From high-spin isomers (I>I/sub grd/ + 10; T/sub 1/2/ > 4 ns) in the A = 150 region it was possible in two cases - ^{146}Gd and ^{151}Dy - to characterize the structure of the isomeric levels and of all yrast states in their decays in terms of the spherical shell model. 14 figures, 1 table (RWR)

32989 (ANL/PHY—79-4, pp 363-367) **Band structure in neutron-deficient ^{103}Cd.** Beraud, R. (Universite Lyon, Villeurbanne, France); Charvet, A.; Duffait, R.; Elias, N.; Meyer, M.; Genevey-Rivier, J.; Treherne, J. Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

Excited states of ^{103}Cd were populated by the ^{94}Mo(^{12}C,3n)^{103}Cd reaction at 54 MeV. The dominant feature of the level scheme is the occurrence of a cascade of strong stretched E2 transitions based on the $7/2^+$ first excited state. Spins and parities are proposed, and the strengths of the gamma transitions are indicated. The quasi particle + rotor model reproduced the experimental data well. 2 figures. (RWR)

32990 (ANL/PHY—79-4, pp 377-384) **High-spin systematics of Z >~ 50 transition nuclei.** Fossan, D.B. (Univ. of California, Berkeley); Chowdhury, P.; Gai, M.; Garg, U.; Piel, W.R.; Shroy, R.E.; Sjoreen, T.P. Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

Several (HI,Xγ) reactions were used to study collective features of the high-spin states in odd-mass $^{119-127}$I, $^{119-133}$Cs, and $^{125-127}$La, as well as in several related Te and Xe nuclei. The emphasis is on the systematics of two collective features observed in these measurements: the Δ J = 1 bands built on low-lying $9/2^+$ states, and Δ J = 2 bands of levels built on low-lying $5/2^+$, $7/2^+$, and $11/2^-$ levels, which are interpreted as 2dS/sub 5/2/, 1g/sub 7/2/, and 1h/sub 11/2/ quasi-proton states. Eight lifetimes and three g factors for high-spin isomers are tabulated. 4 figures, 1 table. (RWR)

32991 (ANL/PHY—79-4, pp 385-388) **Multiparticle high spin excitations in $^{144}_{62}$SM$_{82}$.** Pengo, R.; Lunardi, S.; Tischler, R.; Nagai, Y.; Broda, R.; Kleinheinz, P. (Kernforschungsanlage, Julich, Germany). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The ^{144}Sm nucleus was investigated through in-beam studies of γ's and conversion electrons following the (α,4n) reaction. The experiments included γ-ray singles angular distribution and two-parameter timing measurements, as well as four-paramter γγ coincidence studies. A previously unobserved short-lived isomer of 1.4 +- 0.3 ns half-life was established. States with spins up to 16 were seen. The observed level scheme is presented and discussed. 2 figures. (RWR)

32992 (ANL/PHY—79-4, pp 389-391) **Decay of the I ~ 20 isomer in ^{146}Gd.** Broda, R.; Kleinheinz, P.; Lunardi, S.; Blomqvist, J. (Kernforschungsanlage, Julich, Germany). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

High-spin states in ^{146}Gd populated in the decay of a 4-ns iosmer at 8916 keV are exhibited and compared with results of a shell-model calculation. Spins and parities are shown, and relative transition strengths are indicated. 1 figure. (RWR)

32993 (ANL/PHY—79-4, pp 393-395) **Yrast states in the two-neutron nucleus $^{148}_{64}$Gd 84.** Lunardi, S.; Ogawa, M.; Maier, M.R.; Kleinheinz, P. (Kernforschungsanlage, Julich, Germany). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

Results of an (α,5n) in-beam study of ^{148}Gd are presented. Spins and parities were determined. Shell-model configurations are indicated and discussed. 1 figure. (RWR)

32994 (ANL/PHY—79-4, pp 397-400) **Particle plus octupole isomers and multiparticle yrast states in $^{147}_{65}$Tb$_{82}$ and $^{149}_{65}$Tb$_{84}$.** Broda, R.; Kleinheinz, P.; Daly, P.J.; Behar, M.; Blomqvist, J. (Kernforschungsanlage, Julich, Germany). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

In-beam γ-and e- experiments were carried out with (α,7n) and (α,8n) reactions on a ^{151}Eu target. Conversion electrons were measured in beam. The resulting level schemes are shown with J/sup π/ assignments. The first excited states of both nuclei are isomeric, and their deexcitation transitions are of M2/E3 character. The existence of a long-lived yrast isomer in ^{149}Tb above 5 MeV is indicated. Experimental results are compared with results of a shell-model calculation. 2 figures. (RWR)

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 32983, 33009

32995 (ANL/PHY—79-4, pp 429-433) **Linear polarization for continuum γ-rays.** Beck, F.A.; Bozek, E.; Byrski, T.; Gehringer, C.; Merdinger, J.C.; Schutz, Y.; Styczen, J.; Vivien, J.P. (CRN and ULP, Strasbourg, France). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The linear polarization of the continuum γ-ray spectrum following neutron emission was measured in two different systems: ^{140}Ce + ^{16}O → ^{152}Dy at 89 MeV and ^{148}Nd + ^{16}O → ^{160}Er at 76 and 85 MeV. A three-Ge(Li) Compton polarimeter was used. For both nuclei the linear polarization observed for high-energy γ-rays was zero within experimental error. The polarization increased with decreasing energy to a maximum around 500 keV, then fell and became negative around 300 keV. 2 figures, 1 table. (RWR)

32996 (ANL/PHY—79-4, pp 435-441) **Measurement of the linear polarization of continuum gamma-rays from (^{32}S,xn) reactions.** Trautmann, W.; Sharpey-Schafer, J.F.; Andrews, H.R.; Haas, B.; Hausser, O.; Taras, P.; Ward, D. (Atomic Energy of Canada Ltd., Ontario). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The continuum γ-radiation feeding high-spin yrast states in oblate ^{151}Dy, ^{152}Dy and prolate $^{156-158}$Er nuclei produced in (^{32}S,xn) reactions at 150 MeV was investigated. The angular distribution coefficient and linear polarization as derived from the measured spectra are shown. In the Er nuclei the dominance of stretched E2 transitions is clearly demonstrated. For the Dy nuclei a similar pattern is observed for E/sub γ/ > 1 MeV; at lower energies, however, a rather small anistropy and polarization are found, and the absence of a strong collective E2 component is apparent. The contrasting character of the pre-yrast γ-decay in the two kinds of nuclei is clearly seen in the continuum results: intensity and linear polarization of the continuum after subtraction of contributions of discrete lines are plotted. 3 figures. (RWR)

32997 (ANL/PHY—79-4, pp 527-534) **Competition between ^{8}Be massive transfer and α-transfer in ^{12}C reactions on ^{100}Mo, ^{128}Te, and ^{154}Sm.** Zolnowski, D.R.; Cala, S.E.; Kahler, A.C.; Yamada, H.; Sugihara, T.T. (Texas A & M Univ., College Station). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

Coincidence studies were performed between α particles and γ rays observed in the ^{12}C bombardment of ^{100}Mo and ^{128}Te at 85 MeV and of ^{154}Sm at 85, 109, and 155 MeV. Representative α and γ spectra are shown. The γ-ray intensities for observed transitions in several of the residual nuclei are tabulated. The massive transfer products show little or no side feeding to yrast states with spins as high as 8 or 10. The relative cross sections for ^{8}Be massive transfer and α transfer were estimated. The ratio of γ-ray intensities obtained 90^0 out of the reaction plane to those obtained in the plane was measured for the ^{12}C + ^{154}Sm system at 85 MeV. 2 figures, 2 tables. (RWR)

32998 (BNL—28166) **Low p/sub T/ inclusive production in hadron-nucleus collisions.** Barton, D.S. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 15p. (CONF-8006108—1). NTIS, PC A02/MF A01.

From 11. international symposium on multiparticle dynamics; Bruges, Belgium (22 Jun 1980).

New experimental results on the A dependence of inclusive hadron scattering are described with emphasis on the projectile fragmentation region. The experiment measured h + A → h' + x, where h was π^+, K^+, or p; h' was π^{+-}, K^{+-}, or p; and A, the nuclear target, was C, Al, Cu, Ag, or Pb. The experimental apparatus consisted of the Fermilab M6E beam line and the Single Arm Spectrometer Facility. An incident beam of 100 GeV/c was used; the production of fast h' was measured over the transverse momentum range from 0.18 to 0.5. Invariant cross sections are presented and fitted to a power law function in A. For all channels, increasing attenuation as a function of A is seen. Fitted values of fragmentation functions of spectator and wounded quarks are shown for pion-induced reactions. 8 figures. (RWR)

32999 (LA—8407-PR, pp 42-47) **Observation of isobaric analog states in (π^+,π^0) reactions.** Jun 1980.

In Medium-energy physics program. Progress report, August 1-October 31, 1979.

π^0 spectra from the (π^+,π^0) reaction on targets from p to ^{208}Pb are shown for energies ranging from 70 to 200 MeV. These measurements constitute the first observation with pions of IAS in heavy nuclei. The energy dependence of the $\pi^- p \rightarrow \pi^0 n$ differential cross section and the A dependence of the 0^0 cross section for (π^+, π^0) reactions to isobaric analog states are also plotted. 6 figures. (RWR)

33000 Observation of giant particle-hole resonances in ^{90}Zr(p,n)^{90}Nb. Bainum, D.E.; Rapaport, J.; Goodman, C.D.; Horen, D.J.; Foster, C.C.; Greenfield, M.B.; Goulding, C.A. (Ohio University, Athens, Ohio 45701). W-7405-ENG-26. *Phys. Rev. Lett.;* **44**: No. 26, 1751-1754(30 Jun 1980).

Neutron spectra from ^{90}Zr(p,n)^{90}Nb at E/sub p/=120 MeV are measured in the angular range 0°-25°. Three giant resonances are seen and are interpreted as the T=4 and T=5 components of the Gamow-Teller strength and an E1 resonance. Gamow-Teller matrix elements are extracted, and a large part of the expected strength is found.

NUCLEAR PROPERTIES AND REACTIONS, A=150-189, THEORETICAL

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 32986, 33039, 33041, 33050

33001 (ANL/PHY—79-4, pp 551-557) **Description of high spin states in the N = 82 region.** Ploszajczak, M.; Faessler, A. (Kernforschungsanlage, Julich, Germany). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The structure rotating rare earth nuclei is discussed. Results of cranking Hartree-Fock calculations at I = 30 and 50 h-bar for these nuclei are shown. Experimental and theoretical energies of yrast levels are compared for ^{146}Gd and ^{152}Dy. 3 figures. (RWR)

33002 (ANL/PHY—79-4, pp 554-563) **Particles-plus-rotor model description of two quasiparticle bands in ^{164}Er.** Neergard, K. (Niels Bohr Institute, Copenhagen, Denmark). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The basic wave functions and Hamiltonian are described. Energy-level density is discussed, and odd-parity levels are plotted. 1 figure. (RWR)

33003 (ANL/PHY—79-4, pp 579-586) **E2-transition rates of the ground-state rotational member.** Sano, M.; Wakai, M. (Osaka Univ., Toyonaka, Japan). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

Experiments have shown that the moment of inertia in the ground-state rotational band increases dramatically as high-spin members of the band are reached. One can attribute this increase to the change in the moment of inertia that accompanies a phase transition from a superfluid state to a normal one. In the case of the phase transition, one would expect that reduced E2-transition probabilities between states in different phase should be hindered. This work provides an estimate for deviations from the rotational values by taking into account the two important non-adiabatic effects of Coriolis antipairing and centrifugal stretching. The angular momentum dependence of the energy gap parameter is calculated by use of a procedure of the Hartree-Fock-Bogoliubov theory. The Hartree-Fock-Bogoliubov equation is solved self-consistently by using the perturbation method. The moment of inertia is obtained by the cranking model with account of the second order of the Coriolis force. A calculation of the reduced E2-transition probability is approximately carried out by use of the angular momentum projection method. Numerical results are obtained for ^{158}Dy and ^{158}Er. 1 figure. (RWR)

33004 (ANL/PHY—79-4, pp 587-589) **Possible involvement of a second aligned band in the backbending in ^{156}Dy.** Peker, L.K.; Hamilton J.H. (Brookhave National Lab., Upton Long Island, NY). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The observed backbending of the yrast band in ^{156}Dy has been interpreted as a result of the crossing of one Stockholm rotation-aligned band SB (produced by a n(i/sub 13/2/)^2(sub I$_0$/ = /sub I$_0$/) max-configuration) with two K = 0$^+$ bands (the ground rotational band, GRB, and a β-vibrational band) with relatively weak mixing. A careful, separate analysis of the assigned GRB and the SB in ^{156}Dy was carried out. The analysis indicates there is a second aligned band. 2 figures.

33005 (ANL/PHY—79-4, pp 591-592) **Effect of strong mixing of Stockholm aligned bands with ground rotational bands in even-even nuclei.** Peker, L.K.; Hamilton, J.H. (Brookhaven National Lab., Upton Long Island, NY). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

In the rotational alignment model, the aligned even spin-parity band (SB$_1$), produced by configurations (j ≧ 9/2)^2 with maximal alignment of both particles along the axis of rotation, has the lowest energy and the maximal intrinsic angular moment I$_{01}$ = I/sub SB (ω)-I/sub GRB/(ω). All of the other aligned superbands, SB$_2$, SB$_3$, etc., produced by the same configurations with positive parity or by other configurations (j$_1$ ≧ 9/2, j$_2$) with negative parity (NPB) and positive parity have smaller alignments and are expected to be higher in energy and have smaller I/sub 0i/, e.g. I$_{01}$(SB$_1$) > I$_{02}$(SB$_2$). However, this expectation is true only if the mixing of SB$_1$ with GRB is neglected. This mixing can strongly decrease the I$_{01}$/ sub eff/ of SB$_1$. An analysis of the observed GRB, SB$_1$, possible positive-parity SB$_2$ and aligned NPB's with even and odd spins in ^{164}Er, where there is small mixing of the GRB and SB$_1$, confirm the expectation that I$_{01}$(SB$_1$)>I$_{02}$(SB) and I$_{01}$(SB$_1$)>I$_0$(NPB). However, the opposite properties for the positive-parity SB$_2$ and the negative-parity aligned bands are predicted in ^{158}Dy, where strong mixing of SB$_1$ and GRB is observed, e.g. I$_{01}$(SB$_1$)<I$_{02}$(SB$_2$ and NPB). 2 figures. (RWR)

NUCLEAR REACTIONS AND SCATTERING

33006 Projectile fragmentation accompanied by incomplete fusion. Wu, J.R.; Lee, I.Y. (Physics Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). W-7405-ENG-26. *Phys. Rev. Lett.;* **45**: No. 1, 8-10(7 Jul 1980).

A two-step-reaction model calculation based on projectile fragmentation (first step), preequilibrium emission, and evaporation emission (second step) is formulated to describe the particle-particle angular correlations and particle-γ correlations in complex projectile-induced reactions. The model gives a good description of the production of fast projectilelike α particles accompanied by incomplete fusion for reactions ^{160}Gd(^{12}C,αxn)/sup 168-x/Er at four incident energies.

NUCLEAR PROPERTIES AND REACTIONS, A=150-189, EXPERIMENTAL

RADIOACTIVE DECAY

33007 Search for α-decay of high spin isomers in rare earth nuclei. Vrba, J.A.; Bingham, C.R.; Guidry, M.W.; Neese, R.E.; Gross, E.E.; Cleary, T.P.; Hensley, D.C.; Hungerford, E.V. (The University of Tennessee, Knoxville, Tennessee 37916). *Phys. Rev., C;* **22**: No. 2, 755-766(Aug 1980).

Using a decay-in-flight technique, a search for 1—100 nsec α decay has been conducted in a variety of rare earth nuclei made in energetic heavy ion reaction. Assuming spherical rigid rotation and α particle formation factors similar to those of the ground state, this lifetime range corresponds to nuclear spins of 30 —50 h-bar where very high spin isomerism has been predicted theoretically. No evidence for α decay was observed. α decay cross section limits are set for 14 systems in which high spin isomers (I>10 h-bar) are known with lifetimes in the range studied. Comparison to theoretical total cross sections allows α-branching ratio estimates to be made.

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 32951, 32988, 32996, 33007, 33019, 33039

33008 (ANL/PHY—79-4) **Symposium on high spin phenomena in nuclei.** (Argonne National Lab., IL (USA)). Oct 1979. Contract W-31-109-ENG-38. 613p. (CONF-790323—). NTIS, PC A99/MF A01.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

Separate abstracts were prepared for 44 of the papers given at this symposium. Six other papers have already been cited in ERA; these papers can be located by reference to the entry CONF-790323 - in the Report Number Index. (RWR)

33009 (ANL/PHY—79-4, pp 95-124) **Yrast traps and very high spin states in the N ~ 82 region.** Khoo, T.L. (Argonne National Lab., IL). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The properties of discrete high-spin states at or near the yrast line are discussed. A possible general relation between the energies and spins of yrast states and the question of whether shape changes are induced by large angular momentum are considered. The emphasis is on particle alignment along a symmetry axis. The yrast lines expected from different modes of motion are shown. High-spin isomers found in bombardment of Sn and Te by ^{32}S are tabulated. The occurrence of high-spin isomers provides a valuable experimental tool for studying by delayed coincidence methods states of even higher spin, which eventually decay into the isomer; use of this technique is described. Spectra from the ^{124}Sn (^{32}S, xn) reaction are shown, and detailed level schemes (J, π, multipolarity, lifetime) are

presented for ^{151}Dy and ^{152}Dy. Plots of energy vs I(I+1) are given and interpreted for these nuclei. 13 figures, 1 table. (RWR)

33010 (ANL/PHY—79-4, pp 401-402) **Yrast states in the four-particle nucleus $^{150}_{65}Tb_{85}$.** Broda, R.; Ogawa, M.; Kleinheinz, P.; Sheline, R.K.; Richter, L. (Kernforschungsanlage, Julich, Germany). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The yrast states of the odd-odd nucleus ^{150}Tb were investigated through the ^{151}Eu (α,5n) and ^{136}Ce(^{18}O,p3n) reactions. The resulting level scheme is shown. Spin assignments are based on conversion-electron data and γ-ray angular distribution results. 1 figures. (RWR)

33011 (ANL/PHY—79-4, pp 403-405) **Converson electron and life time measurements in $^{150}_{66}Dy_{84}$.** Lunardi, S.; Ogawa, M.; Backe, H.; Piiparinen, M.; Nagai, Y.; Kleniheinz, P. (Kernforschungsanlage, Julich, Germany). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

^{150}Dy was studied in (α,6n) and ^{136}Ce(^{18}O,4ne$^-$) experiments. Firm spin-parity assignments were made for states with spins as high as 20$^-$. Lifetimes of 1.7 +- 0.2 and 1.1 +- 0.3 ns were established for levels at 4.57 and 3.03 MeV, respectively. The f/sub 7/2/ neutron effective quadrupole transition charge was determined to be 3.6 +- 0.2 e. Proposed configuration assignments are indicated on the level scheme. 1 figure. (RWR)

33012 (ANL/PHY—79-4, pp 407-411) **Yrast isomers in $^{81}_{66}Dy_{85}$.** Piiparinen, M.; Kleinheinz, P.; Lunardi, S.; Backe, H.; Blomqvist, J. (Kernforschungsanlage, Julich, Germany). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

^{151}Dy was studied in ^{152}Gd (α,5n) and ^{136}Ce(^{18}O,3ne$^-$) reactions. Three isomeric half-lives were extracted from $\gamma\gamma$ coincidence data: 15 +- 3 ns (for the 6.03-MeV, 49/2 state), 5.5 +-1.0 ns (for the 4.90-MeV, 41/2$^-$ state), and 1.3 +- 0.6 ns (for the 2.96-MeV, 27/2$^-$ state). The level scheme is presented and discussed; spins, parities, shell-model configurations, and some transition multipolarities are indicated. 2 figures. (RWR)

33013 (ANL/PHY—79-4, pp 421-428) **Determination of the excitation energy of high spin isomers.** Bjoernholm, S. (Niels Bodr Inst., Risoe, Denmark); Borggreen, J.; Christensen, O.; Del Zoppo, A.; Herskind, B.; Pedersen, J.; Sletten, G. Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The sum spectrometer technique to study delayed radiation is discussed. Results on half-lives and isomer excitation energies are presented for ^{144}Gd, ^{147}Gd, ^{148}Tb, ^{151}Dy, ^{152}Dy, $^{149-153}$Ho, ^{151}Er, ^{153}Er, and ^{154}Er. 2 figures, 1 table. (RWR)

33014 (ANL/PHY—79-4, pp 443-445) **High spin band structure in ^{160}Yb.** Beck, F.A.; Bozek, E.; Byraski, T.; Gehringer, C.; Merdinger, J.C.; Schutz, Y.; Styczen, J.; Vivien, J.P. (CRN and ULP, Strasborg, France). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

States in ^{160}Yb were populated in the ^{148}Sm(^{16}O,4n) reaction at 90 to 110 MeV. The deduced level scheme is presented. Levels up to 30$^+$ were seen; two side bands were also found. The data for the transitions within the bands are consistent with stretched E2 decay. 1 figure. (RWR)

33015 (ANL/PHY—79-4, pp 447-453) **High spin states in neutron rich rare earth nuclei.** Bohn, H. (Technical Univ., Munich Germany); Faestermann, T.; Feilitzsch, F.V.; Kienle, P.; Sunyar, A.W.; Emling, H.; Fuchs, P.; Grosse, E.; Schwalm, D.; Wollersheim, H.J. Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

^{208}Pb multiple Coulomb excitation was used to investigate ^{170}Er, ^{178}Hf, and ^{180}Hf. Bombarding energies between 4.7 and 5.4 MeV/A and a particle-gamma coincidence technique were used. Gamma spectra for ^{170}Er and ^{180}Hf are shown, and the dependence of the moment of inertia on the rotational frequency is plotted for the nuclei studied (and ^{174}Hf). 3 figures. (RWR)

33016 (ANL/PHY—79-4, pp 455-461) **Backbending in ^{178}W.** Dracoulis, G.D.; Walker, P.M. (Australian National Univ., Canberra). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The ^{170}Er(^{12}C,4n)^{178}W reaction at 66 MeV was used to populate high-t_1 states. The assignment of transitions to ^{178}W was made primarily on the basis of γ-γ coincidence measurements. Several transitions between high-spin states are discussed. The moment of inertia curves for the yrast bares in the tungsten isotopes and shown, are the high-spin behavior in these isotopes is summarized. 2 figures. (RWR)

33017 **Nuclear data sheets for A=152.** Baglin, C.M. (Wright Nuclear Structure Laboratory, Yale University, New Haven, Connecticut 06520). EY-76-C-02-3074. *Nucl. Data Sheets;* **30**: No. 1, 1-169(May 1980).

Experimental data available prior to September 1979 for decays of or reactions leading to A=152 nuclei have been evaluated and summarized. This evaluation was edited for computer reproduction by M. J. Martin from the more complete evaluation prepared by C. M. Baglin and available from the latter as Internal Report #66, Wright Nuclear Structure Laboratory, Yale University.

MOMENTS AND SPIN

33018 (ANL/PHY—79-4, pp 255-283) **Magnetic and quadrupole moments of high spin states.** Haeusser, O. (Atomic Energy of Canada Ltd., Chalk River, Ontario). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The emphasis of the paper is on the prospects for obtaining moments of static high-spin states, rather than on the presentation of a catalog of results. The first part shows that recent developments in the use of transient magnetic fields have made it possible to obtain g factors for states with lifetimes shorter than 1 ps and, for the first time, g factors of collective high-spin states. The second part is concerned with high-spin yrast states characterized by the alignment of the spins of single-particle orbitals. It is demonstrated that magnetic and quadrupole moments play a unique role in determining the quasi-particle structure and deformation of long-lived yrast traps. Moments of inertia and g factors are shown for ^{170}Yb, ^{172}Yb, and ^{174}Yb, as are yrast level energies, g factors, and static quadrupole moments for ^{152}Dy. 15 figures, 1 table. (RWR)

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 32997, 33015, 33024, 33025

33019 (ANL/PHY—79-4, pp 311-334) **Spectroscopy for non-equilibrium processes in heavy-ion reactions.** Sugihara, T.T.; Zolnowski, D.R.; Kahler, A.C.; Yamada, H. (Texas A & M Univ., College Station). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The use of nonequilibrium reactions as a means to probe high-spin phenomena in heavy-ion reactions is discussed. The massive-transfer process appears to have useful applications in spectroscopy because the reaction tends to filter out lower-spin events. Some recent results on ^{14}N + ^{159}Tb, ^{14}N + ^{154}Sm, and ^{13}C + ^{154}Sm reactions are shown, and the reaction mechanism is addressed. Predictions of the Blann pre-equilibrium model are compared qualitatively with the experimental results. 11 figures, 2 tables. (RWR)

SPONTANEOUS AND INDUCED FISSION

REFER ALSO TO CITATION(S) 33049

NUCLEAR PROPERTIES AND REACTIONS, A=190-219, EXPERIMENTAL

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 33025, 33029

33020 (ANL/PHY—79-4, pp 463-468) **Quadrupole moments of the 12$^+$ states in ^{206}Pb and ^{200}Pb.** Mahnke, H.E. (Suny-Stony Brook, New York, NY); Dafni, E.; Sprouse, G.D.; Alexander, T.K.; Andrews, H.R.; Haeusser, O.; Taras, P.; Ward, D. Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

Hg was used as a host to measure the quadrupole interaction of the 12$^+$ (i/sub 13/2/)$^{-2}$ isomeric states of ^{200}Pb and ^{206}Pb. The states were populated and aligned by the (sup A-2Hg/ (α,2n)/sup A/ Pb reaction at 33 MeV. The quadrupole modulation was measured with the standard perturbed angular distribution method. The modulation spectra for the 12$^+$ states observed at T = 202K are shown. Results on the lifetimes, B(E2) values, and quadrupole moments of the 12$^+$ states are tabulated. 2 figures, 1 table. (RWR)

33021 (ANL/PHY—79-4, pp 469-476) **High-spin states in ^{205}At and systematics of the odd-proton $^{205-213}$At isotopes.** Sjoreen, T.P. (Indiana Univ. Cyclotron Facility, Bloomington); Fossan, D.B.; Garg, U.; Neskakis, A.; Poletti, A.R.; Warburton, E.K. Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

High-spin states in ^{205}At were populated with the ^{197}Au(^{12}C,4n) reaction at 77 MeV. In-beam γ-ray measurements with Ge(Li) detectors of γ-ray excitation functions, γ-γ coincidences, γ-ray angular distributions, and pulsed beam-γ timing were made to establish a decay scheme, level energies, J/sup π/ assignments, γ-ray multipolarities, and isomeric lifetimes. The energy-level scheme is presented; evidence for two isomeric states is noted. The yrast levels of the odd-mass At isotopes are discussed at some length. 3 figures. (RWR)

33022 **Muonic isomer shift of the first excited 2$^+$ state in ^{204}Pb.** Hoehn, M.V.; Shera, E.B.; Wohlfahrt, H.D. (Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Phys. Rev., C;* **22**: No. 2, 678-680(Aug 1980).

Evidence of the excitation of the 899-keV 2$^+$ state in muonic ^{204}Pb has been obtained. The isomer shift of the nuclear E2 ground-state transition is found to be -1.98 +- 0.16 keV, a value that is in disagreement with interpretation of the first excited state as a volume-conserving one-phonon quadrupole vibration.

MOMENTS AND SPIN

REFER ALSO TO CITATION(S) 33020

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 32998

33023 (ANL/NDM—51) **Measured and evaluated neutron cross sections of elemental bismuth.** Smith, A.; Guenther, P.; Smith, D.; Whalen, J.; Howerton, R. (Argonne National Lab., IL (USA)). Apr 1980. Contract W-31-109-ENG-38. 90p. NTIS, PC A05/MF A01.

Neutron total cross sections of elemental bismuth are measured with broad resolution from 1.2 to 4.5 MeV to accuracies of ≈ 1%. Neutron-differential-elastic-scattering cross sections of bismuth are measured from 1.5 to 4.0 MeV at incident neutron energy intervals of ~< 0.2 MeV over the scattered-neutron angular range ≈ 20 to 160 deg. Differential neutron cross sections for the excitation of observed states in bismuth at 895 +- 12, 1606 +- 14, 2590 +- 15, 2762 +- 29, 3022 +- 21, and 3144 +- 15 keV are determined at incident neutron energies up to 4.0 MeV. An optical-statistical model is deduced from the measured values. This model, the present experimental results, and information available elsewhere in the literature are used to construct a comprehensive evaluated nuclear data file for elemental bismuth in the ENDF format. The evaluated file is particularly suited to the neutronic needs of the fusion-fission hybrid designer. 87 references, 10 figures, 6 tables.

33024 (ANL/PHY—79-4, pp 511-518) **Competition between decay modes of high-spin compound nuclei produced in ^{6}Li-induced fusion.** Vigdor, S.E.; Karwowski, H.J.; Jacobs, W.W.; Kailas, S.; Singh, P.P.; Soga, F.; Yip, P. (Indiana Univ., Bloomington). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

Absolute integral cross sections for fission, proton evaporation, α-particle evapoartion, and neutron emission from compound nuclei formed in the bombardment of ^{181}Ta, ^{194}Pt, ^{198}Pt, ^{197}Au, and ^{208}Pb by ^{6}Li beams were measured at lab energies of 75, 85, and 95 Mev. The total fusion cross sections were also determined. Complete fission-fragment angular distributions exhibit a clear symmetry about theta/sub cm/ = 90^0. The evaporation peaks were clearly discerned in the Z = 1 and Z = 2 spectra. Statistical-model calculations of the fission cross section and anisotropy for ^{6}Li + ^{197}Au at 94.5 MeV illustrate the sensitivities to multichance fission and to the assumed diffuseness of the spin distribution in the compound nucleus. 4 figures. (RWR)

33025 (ANL/PHY—79-4, pp 519-526) **Multiplicity of K x rays emitted in (^{6}Li,xn) reactions.** Karwowski, H.J. (Indiana Univ., Bloomington); Vigdor, S.E.; Jacobs, W.W.; Kailas, S.; Singh, P.P.; Soga, F.; Floughe, W.D. Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The first direct measurements of K x-ray multiplicities following fusion reactions are reported. Such measurements provide an important new tool in the determination of absolute evaporation-residue cross sections and the investigation of nuclear transition multipolarities in high-multiplicity gamma cascades. The mean K x-ray multiplicity, <M/sub K/>, was measured for (^{6}Li,xn) reactions induced on ^{181}Ta, ^{194}Pt, ^{197}Au, ^{198}Pt, and ^{208}Pb at energies of 75, 85, and 95 MeV (lab). The measurements were made by two independent techniques, involving detection of coincidences between K x rays and γ rays, or two (or three) K x rays, from the xn products (of atomic number Z/sub t/ + 3). Representative x-ray (^{194}Pt, ^{197}Au) and γ-ray (^{197}Au) spectra are shown. <M/sub K/> values and cross sections are tabulated. 2 figures, 2 tables. (RWR)

33026 (LA—8407-PR, pp 24-26) **Pion double-charge-exchange reactions on ^{209}Bi.** Jun 1980.

In Medium-energy physics program. Progress report, August 1-October 31, 1979.

Astatine formation cross sections for π^+ and π^- bombardments of ^{209}Bi at 100 and 300 MeV are reported. In addition to reactions of the type ^{209}Bi(π^+,π^-xn)$^{209-x}$At, there may be substantial contributions due to secondary processes, in which the incident pion interacts with the target nucleus to cause energetic α and/or ^{3}He formation. These secondaries may then lead to At products through reactions like ^{209}Bi(α,xn) or ^{209}Bi(^{3}He,xn). 1 figure, 1 table. (RWR)

33027 (LA-UR—80-1920) **Cross section and analyzing power in the ^{206}Pb(→t,p) ^{208}Pb(4$^-$) reaction.** Alford, W.P.; Boyd, R.N.; Sugarbaker, E.; deBoer, J.; Brown, R.E.; Flynn, E.R. (University of Western Ontario, London (Canada); Ohio State Univ., Columbus (USA); Colorado Univ., Boulder (USA); Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 4p. (CONF-800824—12). NTIS, PC A02/MF A01.

From 5. international symposium on polarization phenomena in nuclear physics; Santa Fe, NM, USA (11 Aug 1980).

Cross sections and analyzing powers were measured in the ^{206}Pb(→t,p) ^{208}Pb reaction leading to the 4$^-$, 5$^-$ states of the (p/sub 1/2/$^{-1}$ g/sub 9/2/) doublet. Standard DWBA calculations reproduce the cross section but not the analyzing power for the 5$^-$ state. The opposite is true for a sequential transfer (t,d) (d,p) calculation for the 4$^-$ state. 1 figure, 1 table.

33028 **^{209}Bi(^{3}He,d)^{210}Po and ^{209}Bi(^{4}He,t)^{210}Po reactions and some matrix elementsof the residual interaction.** Groleau, R.; Lanford, W.A.; Kouzes, R. (A. W. Wright Nuclear Structure Laboratory, Yale University, New Haven, Connecticut 06520). EY-76-C-02-3074. *Phys. Rev., C;* **22**: No. 2, 440-455(Aug 1980).

The (^{3}He,d) and (^{4}He,t) single proton transfer reactions on ^{208}Pb and ^{209}Bi were studied using 30 and 40 MeV He beams. The outgoing reaction products were detected by a position sensitive proportional counter in the focal plane of a quadrupole-three-dipole spectrometer. The resolution varied between 10 and 14 keV full width at half maximum. Using the ratio of cross sections for the (^{3}He,d) and (^{4}He,t) reactions to determine l transfers, spectroscopic factors for the reactions on ^{209}Bi have been measured relative to the transitions to the single-particle states observed in reactions on ^{208}Pb. Sum rules are applied and diagonal matrix elements of the effective interaction between valence protons around the ^{208}Pb core are deduced. The matrix elements obtained from empirical interactions and from realistic calculations are compared to these extracted matrix elements.

33029 **^{204}Pb(n,n'γ)^{204}Pb reaction.** Dawson, W.K.; Green, P.W.; Hooper, H.R.; Neilson, G.C.; Shepard, D.M.; Siefken, H.E.; Smith, D.L.; Davidson, J.M. (Nuclear Research Center, The University of Alberta, Edmonton, Alberta T6G 2N5, Canada). *Phys. Rev., C;* **22**: No. 2, 928-932(Aug 1980).

The excited states of ^{204}Pb were studied using the ^{204}Pb(n,n'γ) reaction. Gamma-ray excitation functions and angular distributions were recorded using a small-sample technique. Previously unreported ^{204}Pb levels were observed at 1605 +- 1, 1682 +- 1, 1762 +- 1, 1873 +- 1, and 2276 +- 3 keV excitation. The spins of the levels at 1682, 1762, 1873, and 2276 keV are J=1, 2, or 3$^+$. The spin and parity of the 1605 keV level is limited to J/sup π/=3$^+$ or 4$^+$. Multipole mixing ratios were measured for several transitions where the initial and final state spins and parities were firmly established from previous work.

33030 **Absolute neutron capture yield calibration.** Macklin, R.L.; Halperin, J.; Winters, R.R. (Oak Ridge National Lab., TN (USA)). *Nucl. Instrum. Methods;* **164**: No. 1, 213-214(1 Aug 1979).

The saturated resonance technique is applied more accurately (<0.5% standard deviation) and efficiently by fitting to the shape of the 4.096 eV ^{197}Au(n, γ) peak by a least-squares procedure.

SPONTANEOUS AND INDUCED FISSION

REFER ALSO TO CITATION(S) 33024

NUCLEAR PROPERTIES AND REACTIONS, A=220 AND ABOVE, THEORETICAL

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 33036

SPONTANEOUS AND INDUCED FISSION

33031 (LA—8298-PR, pp 16-21) **Delayed neutron data and calculations.** England, T.R.; Wilson, W.B.; Whittemore, N.L. Mar 1980.

In Applied nuclear data research and development. Progress report, October 1-December 31, 1979.

Half-lives and emission probabilities are tabulated for 105 delayed neutron precursors, along with delayed-neutron multiplicities for 20 yield sets in ENDF/B-V. Calculated ν/sub d/-bar spectra for fast fission of ^{235}U and ^{239}Pu are shown. 2 figures, 3 tables (RWR)

33032 (LA—8418-PR, pp 14-21) **Steady-state transfer tables for delayed photons from fission.** La Bauve, R.J.; George, D.C. Jun 1980.

In Applied nuclear data research and development. Progress report, January 1-March 31, 1980.

Steady-state transfer tables were prepared for delayed photons from fission in the BUGLE multigroup structure. Tabulated results are given for thermal fission of ^{235}U, ^{238}U, ^{239}Pu, and ^{241}Pu, fast fission of ^{232}Th, ^{235}U, ^{238}U, and ^{239}Pu, and 14-MeV fission of ^{238}U and ^{238}U. Several tests and comparisons were made to check the validity of the results. 10 figures, 12 tables. (RWR)

33033 **Muon-induced fission as a probe for fission dynamics.** Maruhn, J.A.; Oberacker, V.E.; Maruhn-Rezwani, V. (Department of Physics & Astronomy, Vanderbilt University, Nashville, Tennessee 37235). W-7405-ENG-26. *Phys. Rev. Lett.;* **44**: No. 24, 1576-1579(16 Jun 1980).

Fission of ^{242}Pu induced by γ radiation less muonic transitions is studied. By solving the time-dependent Schroedinger equation for the muonic wave function in an axially symmetric spatial grid, one finds an observable dependence of the muonic final state: both in the localization of the muon and its excitation probability: on fission dynamics. More refined studies should allow one to extract information about the friction coefficient in a fission.

NUCLEAR PROPERTIES AND REACTIONS, A=220 AND ABOVE, EXPERIMENTAL

RADIOACTIVE DECAY

33034 **Half-life of ^{230}Th.** Meadows, J.W.; Armani, R.J.; Callis, E.L.; Essling, A.M. (Argonne National Laboratory, Argonne, Illinois 60439). W-31-109-ENG-38. *Phys. Rev., C;* **22**: No. 2, 750-754(Aug 1980).

The half-life of ^{230}Th was measured by the specific activity method. Alpha counting was done in a low geometry counter whose geometry factor was calculated from its dimensions. Sample weights were determined by isotopic dilution. Measurements were made on four isotopic mixtures ranging from 0.383 to 99.52% ^{230}Th. The half-life is 75381 +- 295 years.

ENERGY LEVELS AND TRANSITIONS

REFER ALSO TO CITATION(S) 32951

33035 (ANL/PHY—79-4, pp 477-485) **Vibrational modes in ^{232}Th from heavy-ion Coulomb excitation.** Briancon, C.; Lefebvre, A.; Libert, J.; Thibaud, J.P.; Walen, R.J. (Centre de Spectrometrie Nucleaire, Orsay, France). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The gamma spectrum coincident with the scattered particles in Coulomb excitation of ^{232}Th by 450-MeV Kr ions is shown first. Then the moments of inertia of the ground and octupole bands are ploted in the usual way as a function of the square of the rotational frequency to display the backbending behavior. The apparent increase of the moments of inertia in the negative-parity bands, with respect to the ground-state band, arises from the strong Coriolis coupling between the $K = 0^- - 3^-$ states of the octupole multiplet, leading to the concentration of the B(E3) strength on the lowest octupole band. Ratios of E2 transition energies of the negative-parity and ground-state bands are shown. The level energies of the ground-state band, as well as the $K = 0^-$, $K = 0^+$, $K = 2^+$ side bands, are tabulated. The results are also summarized in a plot of moments of inertia vs (h-bar ω)^2. 4 figures, 1 table. (RWR)

33036 (ANL/PHY—79-4, pp 487-493) **Rotational bands in ^{235}U comparison with rotor-plus-quasiparticle calculations using H.F. orbitals.** Bettencourt, J. (Centre de Spectrometrie Nucleaire, Orsay, France); Briancon, C.; Libert, J.; Thibaud, J.P.; Walen, R.J.; Quentin, P.; Gizon, A. Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

^{235}U was Coulomb excited with ^{84}Kr beams of 370 and 450 Mev. Observed energy levels are tabulated. Then the spectrum of ^{235}U was determined from self-consistent calculations of the neighboring even-even core nuclei ^{234}U and ^{236}U within a rotor-plus-quasi-particle approach. The calculations reproduced the trends of the experimental low-energy spectrum quite well; this fact confirms the rotational nature of ^{235}U. 1 figure, 2 tables. (RWR)

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 33035

33037 (DOE/ER/10344—2) **Neutron scattering studies in thorium and uranium. Progress report, 1 September 1979-30 June 1980.** Beghian, L.E.; Kegel, G.H.R. (Lowell Univ., MA (USA). Dept. of Physics and Applied Physics). 1980. Contract AC02-79ER10344. 41p. NTIS, PC A03/MF A01.

Analysis of (n,n'γ) measurements is now essentially complete, and level cross sections inferred from these data have been extracted for twenty-seven levels up to E/sub x/ = 1516 keV in ^{238}U, and for thirty-seven levels up to E/sub x/ = 1738 keV in ^{232}Th. One goal of the present work is to compare the level cross sections obtained from (n,n'γ) with those from (n,n') measurements, to determine whether the former values are generally lower due, for example, to E0 contributions. Inelastic neutron scattering from high-lying states near 1 MeV excitation was measured in both ^{232}Th and ^{238}U, over the range of incident energies corresponding to the (n,n'γ) studies. So far the results show no significant discrepancies between the (n,n'γ) and (n,n') cross sections for most levels near theshold. Considerable progress was made on the near-threshold measurements of inelastically scattered neutrons from the 45-keV first excited state in ^{238}U. These measurements were conducted using both the standard disk scatterer geometry and a ring scatterer with forward-angle geometry. These two very different techniques give cross sections in excellent agreement with one another; the measurement at 81 keV is the lowest energy measurement of this type published to date. Improved time resolution was also demonstrated using thin, ring-shaped scatterers at back angles. Data reduction capabilities have been further enhanced by the acquisition of several new peripherals. 17 figures, 1 table. (RWR)

SPONTANEOUS AND INDUCED FISSION

33038 (UCRL—52945) **Study of calculated and measured time dependent delayed neutron yields.** Waldo, R.W. (California Univ., Livermore (USA). Lawrence Livermore Lab.). May 1980. Contract W-7405-ENG-48. 179p. NTIS, PC A09/MF A01.

Thesis.

Time-dependent delayed neutron emission is of interest in reactor design, reactor dynamics, and nuclear physics studies. The delayed neutrons from neutron-induced fission of ^{232}U, ^{237}Np, ^{239}Pu, ^{241}Am, /sup 242m/Am, ^{245}Cm, and ^{249}Cf were studied for the first time. The delayed neutron emission from ^{232}Th, ^{233}U, ^{235}U, ^{238}U, ^{239}Pu, ^{241}Pu, and ^{242}Pu were measured as well. The data were used to develop an empirical expression for the total delayed neutron yield. The expression gives accurate results for a large variety of nuclides from ^{232}Th to ^{252}Cf. The data measuring the decay of delayed neutrons with time were used to derive another empirical expression predicting the delayed neutron emission with time. It was found that nuclides with similar mass-to-charge ratios have similar decay patterns. Thus the relative decay pattern of one nuclide can be established by any measured nuclide with a similar mass-to-charge ratio. A simple fission product yield model was developed and applied to delayed neutron precursors. It accurately predicts observed yield and decay characteristics. In conclusion, it is possible to not only estimate the total delayed neutron yield for a given nuclide but the time-dependent nature of the delayed neutrons as well. Reactors utilizing recycled fuel or burning actinides are likely to have inventories of fissioning nuclides that have not been studied until now. The delayed neutrons from these nuclides can now be incorporated so that their influence on the stability and control of reactors can be delineated. 8 figures, 39 tables.

NUCLEAR THEORY

REFER ALSO TO CITATION(S) 32952

NUCLEAR STRUCTURE

REFER ALSO TO CITATION(S) 32953, 32954, 33046, 33049

33039 (ANL/PHY—79-4, pp 1-32) **Study of single particle angular momentum alignment in rotating nuclei.** Mottelson, B. (Nordita, Copenhagen, Denmark). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The connection between the observed yrast spectra of certain nuclei and the calculations of independent-particle motion in rotating deformed potentials including the effect of pairing is discussed in detail. The rotational motion is characterized, not by the angular momentum, but by the frequency related to it. The Hamiltonian is examined to identify the quantum number that characterizes the one-particle states. The patterns encountered in the quantal spectra of one-particle motion in a rotating potential are described, and then

the effects of the pair correlation on the independent-particle orbits are elucidated. Finally, the theoretical picture is confronted with some detailed energy-level diagrams of ^{160}Yb and ^{161}Yb. The theory gives a simple interpretation to the data. 16 figures, 1 table. (RWR)

33040 (ANL/PHY—79-4, pp 155-163) **Structure of yrast state in the N ≃ 126 and N ≃ 82 regions from a shell model perspective.** Blomqvist, J. (Research Institute of Physics, Stockholm, Sweden). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The structure of nuclei around closed shells is discussed. Methods commonly used for calculations of yrast state energies are described. Some results of calculations in the regions near N = 126 and N = 82 are reviewed. 1 figure, 2 tables. (RWR)

33041 (ANL/PHY—79-4, pp 197-222) **Properties of yrast states and yrast traps.** Leander, G. (Nordita, Copenhagen, Denmark); Andersson, C.G.; Nilsson, S.G.; Ragnarsson, I.; Aberg, S.; Almberger, J.; Dossing, T.; Neergaard, K. Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

Some recent numerical calculations aiming to describe yrast properties are discussed with regard to the relation between the calculated results, experimental data, and general physical trends. The topics range over peculiar alignment phenomena in the deformed rare earth nuclei, high-spin yrast traps in the supposedly oblate A ~ 75 and A ~ 150 regions, the remarkably large effective moment of inertia in the A ~ 150 region, and shell structure in hypothetical, superdeformed nuclei. It may be emphasized that similar theoreical concepts enter into all the different calculations. 10 figures.

33042 (LBL—10957) **Nuclear structure at high angular momentum.** Stephens, F.S. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). Jun 1980. Contract W-7405-ENG-48. 110p. NTIS, PC A06/MF A01.

This review paper begins by discussing the limits faced in the attempts to get nuclei to hold very high angular momentum. The method presently used to produce nuclei with the maximum angular momentum is described. Then the physics of high-spin states is taken up; some properties of a purely collective, classical rotor are described, and the effects of coupling single-particle motion to this are considered. Next, backbending, its causes, and a new spectroscopy of bands and backbends at high spin values are discussed. Noncollective states occur when the nuclear angular momentum is carried by a few high-j particles and is aligned along a symmetry axis. There results an irregular yrast line, along which there are no collective transitions. Noncollective behavior in the lead region, the hafnium region, and the N = 82 region is examined. Then the discussion moves on to collective behavior and recent studies on continuum spectra. Evidence for rotation is given, and effective moments of inertia for this rotation are evaluated. Finally, current γ-ray energy correlation studies are described. 68 references, 36 figures. (RWR)

33043 (UCID—18740) **Statistical methods for including two-body forces in large system calculations.** Grimes, S.M. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Jul 1980. Contract W-7405-ENG-48. 14p. NTIS, PC A02/MF A01.

Large systems of interacting particles are often treated by assuming that the effect on any one particle of the remaining N-1 may be approximated by an average potential. This approach reduces the problem to that of finding the bound-state solutions for a particle in a potential; statistical mechanics is then used to obtain the properties of the many-body system. In some physical systems this approach may not be acceptable, because the two-body force component cannot be treated in this one-body limit. A technique for incorporating two-body forces in such calculations in a more realistic fashion is described. 1 figure.

NUCLEAR REACTIONS AND SCATTERING

REFER ALSO TO CITATION(S) 33051, 33053

33044 (ANL/PHY—79-4, pp 285-310) **Alignment, polarization, and magnitude of fragment angular momenta in deeply inelastic collisions.** Vandenbosch, R. Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The angular momentum appearing in the products of quasi- and deeply inelastic collisions is reviewed. Both the magnitude and the orientation of the angular momentum are considered. After a brief review of what is known about quasi-and deeply inelastic collisions, the subject is treated under the following topics: asymptotic limits for the magnitude and orientation of transferred angular momentum, information deduced from gamma ray measurements (gamma multiplicities, angular correlations for gamma rays, circular polarization of gamma rays), and sequential fission measurements of angular momentum transfer. The report ends with some suggestions as to possible applications of deeply inelastic collisions to the study of nuclei with high spin. 12 figures. (RWR)

33045 (ANL/PHY—79-4, pp 535-540) **Massive transfer reaction as a probe for high-spin states.** Kishimoto, T. (Texas A & M Univ., College Station); Kubo, K.I. Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The massive transfer reaction is viewed as a process in which a light fragment breaks away from the projectile without being absorbed by the target, but a heavy fragment is captured by the target by a compound capture process. The process is formulated theoretically, and the reaction cross section and the distribution of angular momenta in residual nuclei calculated. (RWR)

33046 (DOE/ER/02972—18) **Progress in research, January 1-December 31, 1979.** (Texas Univ., Austin (USA)). Jan 1980. Contract EY-76-C-05-2972. 115p. (ORO—2972-18). NTIS, PC A06/MF A01.

Research in theoretical nuclear physics during 1979 is reported. Areas of research included the following: reactions induced by low-energy light ions, heavy-ion-induced reactions, medium-energy physics, and nuclear collective motions. From the extensive list of references one may assume that completed work has been or will be published in the usual channels. 34 figures. (RWR)

33047 (IS-T—883) **Multiple scattering theory and applications for intermediate energy reactions of nuclei.** Ludeking, L.D. (Iowa State Univ. of Science and Technology, Ames (USA)). 1979. Contract W-7405-ENG-82. 154p. NTIS, PC A08/MF A01.

Interactions of two composite clusters are treated in a multiple scattering framework whereby many-particle operators are decomposed into a systematic and finite series such that there is an ordered sequestering according to particle rank. Thus, an N-body operator is written as the superposition of all distinct groupings of interactions that occur between particle pairs, triplets, quartets, etc., such that all groupings contain at least one particle from each of the composite systems. It is demonstrated how the transition operator, a reaction operator, and an optical potential may be described in this context. The general structure of such decompositions is shown, and the connection to the standard multiple-scattering prescriptions, delineated. The direct reaction amplitude for stripping and pickup is described, and the two potential formula of Gell-Mann and Goldberger is derived. The multiple scattering formalism for direct reactions is constructed in the eikonal approximation. The sensitivity of the transition cross section to the target density and nucleon-nucleon density correlations are examined in this framework. The limitations of the zero-range approximation to the deuteron vertex function are examined by comparison with the finite-range vertex function at a range of energies. 25 figures, 5 tables.

33048 **Markovian and non-Markovian effects in heavy-ion reactions at 10 —200 MeV per nucleon.** Hernandez, E.S.; Mantzouranis, G. (Nuclear Science Division, Lawrence Berkeley Laboratory, Berkeley, California 94720). *Phys. Rev., C;* 22: No. 2, 575-582(Aug 1980).

We have derived simplified formulas for the transition probability from an entrance channel vertical-bari> to an exit channel vertical-bar f> that corresponds to a heavy-ion reaction. It is shown that a rearrangement of the perturbation series leads to an expansion of the cross section in terms of the ratio y between the duration of a nucleon-nucleon collision and the elapsed time between two successive interactions. The cross section splits into two contributions, the Markovian part independent of y, and the non-Markovian one containing explicit y dependence. Such a decomposition allows us to demonstrate that a transition from the Markovian to the non-Markovian behavior is to be expected around 20 MeV per particle in the initial channel. This transition manifests itself in a change in the slope of the width of the mass distribution as a function of the incident energy. This fact seems to be in agreement with existing data.

SPONTANEOUS AND INDUCED FISSION

REFER ALSO TO CITATION(S) 33164

33049 (ANL/PHY—79-4, pp 541-549) **Stability of the nucleus at very high spin states; anomalous behaviour of the He-emission width.** Ploszajczak, M.; Faber, M.E.; Faessler, A. (Kernforschungsanlage, Julich, Germany). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

Deformation energy surfaces near fission and the dependence of the fission barrier on the angular momentum are studied. A new parametrization of the fission neck is introduced. Nuclear potential energy is obtained from the Strutinsky shell correction method, extended for finite angular momenta and temperatures. Barrier height and shell corrections for various angular momenta in ^{190}Hg are tabulated, as are equilibrium values of β and r parameters calculated by minimizing the free energy or the potential energy. Inclusion of the neck degree of freedom may also significantly

change estimates for giant backbending angular momenta for the shape instability leading to fisson; this quantity is tabulated for eight nuclei from ^{122}Sn to ^{232}Th. The separation energies for ^{4}He particles from the compound systems ^{150}Gd and ^{202}Pb are plotted. The occurrence of yrast traps in ^{202}Pb is discussed. 2 figures, 4 tables. (RWR)

NUCLEAR MODELS

REFER ALSO TO CITATION(S) 32987, 33046

33050 (ANL/PHY—79-4, pp 165-195) **Hartree Fock and random phase theory of high spin states.** Mang, H.J. (Technical Univ. Munich, Germany). Oct 1979.

From Symposium on high spin phenomena in nuclei; Argonne, IL, USA (15 Mar 1979).

The Inglis cranking model and the self-consistent cranking model are briefly described first. Then results (energy levels, transition rates and moments) obtained with the self-consistent cranking model are discussed; most of these concern ^{164}Er. The bulk of the paper presents a discussion on the validity of the cranking approximation. 14 figures. (RWR)

33051 **Unitary content of the optical potential for an uncorrelated target.** Schneider, D.M. (Department of Physics and Astronomy, University of Maryland, College Park, Maryland 20742). EY-76-S-02-2171. *Phys. Rev., C;* **22**: No. 2, 362-373(Aug 1980).

The optical potential for an uncorrelated target is derived. Operator identities are used to obtain the partial cross sections to all reactive channels in this model. Using a set of approximations, the optical potential is written in first-order form. The partial cross sections to all channels implied by the first-order potential can be written as a generalization of the usual distorted-wave impulse approximation. Under certain assumptions a sum rule is obtained. The high-energy limit of our results is then examined by the use of Glauber's theory.

33052 **Relationship between the Bohr collective Hamiltonian and the interacting-boson model.** Ginocchio, J.N.; Kirson, M.W. (Theoretical Division, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Phys. Rev. Lett.;* **44**: No. 26, 1744-1747(30 Jun 1980).

A Bohr Hamiltonian expressed in terms of the shape and rotational degrees of freedom of an ellipsoid is derived from an interacting-boson model Hamiltonian.

33053 **Classical limit of the interacting-boson model.** Dieperink, A.E.L.; Scholten, O.; Iachello, F. (Kernfysisch Versneller Instituut, University of Groningen, 9700av Groningen, The Netherlands). EY-76-C-02-3074. *Phys. Rev. Lett.;* **44**: No. 26, 1747-1750(30 Jun 1980).

A set of classical variables associated with the interacting-boson model is defined. It is shown that these variables can be put in one-to-one correspondence with Bohr's liquid-drop variables. The classical equilibrium "shapes" corresponding to the three limits of the interacting-boson model are analyzed and the nature of the "shape" phase transitions between them is studied.

RADIATION AND SHIELDING PHYSICS

RADIATION PHYSICS

33054 (DOE/TIC—11234) **Experience with TRIPOLI at ORNL.** Cramer, S.N.; Roussin, R.W. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 11p. NTIS, PC A02/MF A01.

Initial use of the TRIPOLI code at Oak Ridge National Laboratory (ORNL) involves calculation of sample problems for both neutron and gamma-rays. Comparison with existing MORSE results indicates that the computing efficiency of TRIPOLI is somewhat better for the problems studied. Calculation of a thick (90cm) concrete and steel ingetral experiment with TRIPOLI gives good agreement with the experimental results. This calculation involved the neutron count rate and unfolded energy spectra as measured in an NE213 detector behind the sample. It was necessary to expand the standard TRIPOLI cross section energy structure near the 2.3 MeV minimum in the total cross section of oxygen (a major constitutent of concrete) to correctly calculate the count rate near this energy.

NEUTRON INTERACTIONS WITH MATTER

REFER ALSO TO CITATION(S) 32613, 33054

33055 **Anomalous flight time of neutrons through diffracting crystals.** Shull, C.G.; Zeilinger, A.; Squires, G.L.; Horne, M.A.; Atwood, D.K.; Arthur, J. (Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). *Phys. Rev. Lett.;* **44**: No. 26, 1715-1718(30 Jun 1980).

The flight time of neutrons through diffracting crystals has been studied experimentally and is found in good agreement with theoretical prediction. The existence of an anomalous drift velocity along lattice planes has been demonstrated and the drift neutrons are shown to exhibit diminished absorption (anomalous Borrmann transmission) in the crystal.

MEDICAL PHYSICS

DOSIMETRY

33056 **Evaluation of adsorbed dose in mammography: Monte Carlo simulation studies.** Doi, K. (Univ. of Chicago, IL); Chan, H.P. Contract EY-76-C-02-0069. *Radiology;* **135**: No. 1, 199-208(Apr 1980).

Computer programs for calculation of the backscatter factor and absorbed dose in breast phantoms are developed based on Monte Carlo simulation. Rad/roentgen conversion factors are calculated for water, fat, a mixture of 50% water and 50% fat, and lucite irradiated with monoenergetic and polyenergetic x rays from a tungsten or molybdenum anode x-ray tube. These factors can be used to estimate skin dose, average depth dose, or average inegral dose in a breast when the beam quality, exposure in air at the skin position, and composition of the breast are known. Calculated backscatter factors are considerably greater than measured values reported previously.

SOLID STATE PHYSICS

REFER ALSO TO CITATION(S) 32910

33057 (CONF-800801—8) **Microdiffraction from crystals containing defects.** Carpenter, R.W. (Oak Ridge National Lab., TN (USA)). 1980. Contract W-7405-ENG-26. 17p. NTIS, PC A02/MF A01.

From Annual meeting of the Electron Microscopy Society of America and 15. Microbeam Analysis Society Conference; San Francisco, CA, USA (4 Aug 1980).

In order to examine defects in crystals using electron diffraction it is desirable to irradiate only the local crystal region containing the defect. Recent improvements in microscope instrumentation, principally in the areas of electron optics and vacuum systems, have made convergent beam electron diffraction a relatively simple experimental method, and it is the method of choice for diffraction investigation of many types of lattice defects. The method itself has been used in crystal physics research for about 40 years, but only recently have applications to materials science problems begun. At present, applications of the method are being made to characterization of grain and interphase boundaries, local foil thickness measurement, lattice defect symmetry characterization, small precipitate crystallography, and other problems at various laboratories. In this paper the method is described, its use for Burgers vector direction determination is illustrated, and use of convergent beam shadow images is discussed.

33058 **Excitation spectrum and low-temperature thermodynamicsof the Ising-Heisenberg linear ferromagnet.** Johnson, J.D.; Bonner, J.C. (Theoretical Division, Los Alamos Scientific Laboratory, Los Alamos, New Mexico 87545). *Phys. Rev., B: Condens. Matter;* **22**: No. 1, 251-265(1 Jul 1980).

Important new analytic results have been obtained for the linear, ferromagnetic, spin-1/2, Ising-Heisenberg model in a small magnetic field. Specifically, for zero field an expression, which changes its form at an intermediate value of the variable anisotropy parameter, has been obtained for the thermal excitation energy gap. This special anisotropy value does not correspond to a symmetry change in the Hamiltonian, but is associated with an important difference in the physical significance of the results. For anisotropy greater than the special value, the dominant excitations correspond to bound spin complexes. For anisotropy less than the special value, the dominant excitations are spin waves. These results govern the low-temperature behavior of the specific heat. The effective magnetic excitation gap, which determines the low-temperature susceptibility, is dominated at zero field by the bound states for all anisotropy. More complex crossover effects occur in both specific heat and susceptibility when the analysis is extended to nonzero field. These results may have an important bearing on the quantum soliton problem in the linear ferromagnet.

33059 **Vacancy-induced transitions in hcp ^{3}He.** Chaddah, P. (Department of Physics and Materials Research Laboratory, University of Illinois at Urbana: Champaign, Urbana, Illinois). EY-76-C-02-1198. *J. Low Temp. Phys.;* **39**: No. 1, 131-136(Apr 1980).

It is known from the work of Nagaoka that in hcp or fcc ^{3}He a ferromagnetic alignment of nuclear spins does not give the lowest vacancy energy. We show that an ordered spin structure has a lower vacancy energy than either random or ferromagnetic structures. We study the possibility of vacancies inducing a transition to this spin structure, and of vacancies forming polarons. The later is found to be more likely, and we estimate the fraction of vacancies forming polarons as a functions of temperature. We briefly comment on the case of a vacancy in crystals of ^{4}He with ^{3}He impurity.

SUPERCONDUCTIVITY

33060 Shape effects in magnetic superconductors. Jaric, M.V. (Department of Physics, University of California, Berkeley, California 94720). *Phys. Rev., B: Condens. Matter;* **22**: No. 1, 463-466(1 Jul 1980).

Within the framework of a recent molecular-field theory of magnetic superconductors we analyze shape effects in magnetic superconductors. For ellipsoidal ferromagnetic superconductors we show: (a) Spontaneous magnetization develops in the direction of minimum demagnetization factor; (b) the upper transition temperature for coexistence of ferromagnetism and superconductivity is a monotonically decreasing function of the demagnetization factor; (c) the lower transition temperature for coexistence may disappear, or the transition may become continuous if the demagnetization factor is sufficiently large; and (d) the directional dependence of the upper and lower critical fields is drastically different from that found in ordinary type-II superconductors.

GENERAL THEORY

33061 (IS-T—901) **Upper critical field in anisotropic superconductors.** Youngner, D.W. (Ames Lab., IA (USA)). Aug 1980. Contract W-7405-ENG-82. 154p. NTIS, PC A08/MF A01.

Thesis.

Theoretical descriptions of the upper critical fields in reentrant and anisotropic superconductors are presented. The theories are essentially microscopic in nature and incorporate many of the effects known to influence the behavior of superconducting electrons. In cases where adequate experimental data exist, the agreement between experiment and theory is found to be good.

ACOUSTIC, ELECTRIC, MAGNETIC, OPTICAL, AND THERMAL PHENOMENA

REFER ALSO TO CITATION(S) 32522, 32565, 32566, 32594, 32605, 32685, 32725, 33061

33062 (DOE/ER/01569—148) **Heat capacity of amorphous and disordered Nb_3Ge thin films.** Rao, N.A.H.K. (Minnesota Univ., Minneapolis (USA). Dept. of Physics and Astronomy). Jun 1979. Contract AS02-76ER01569. 194p. NTIS, PC A09/MF A01.

Thesis.

Heat capacity measurements on 1000 to 1500A thick amorphous Nb_3Ge and granular Al films have been carried out using an ac technique. The major goal of the experiment was to study the effect of thermal fluctuations, both above and below the superconducting transition temperature T/sub c/, in dirty, short meanfree path materials.

33063 (IS-T—904) **Superconducting tunneling study of V and V_3Ga.** Zasadzinski, J.F. (Ames Lab., IA (USA)). Aug 1980. Contract W-7405-ENG-82. 110p. NTIS, PC A06/MF A01.

Thesis.

The technique of proximity effect tunneling spectroscopy (PETS) has been applied to the transition metal, vanadium, and to the A-15 compound V_3Ga. The method employs the deposition of a thin layer ($\leq$ 100 A) of Al in ultra-high vacuum to form proximity junctions of the form C-Al_2O_3-Al/S. Here S is the superconductor of interest and C is any convenient counterelectrode. A description of the experimental techniques and discussion of the underlying theory along with methods of analysis are presented. Results include the energy dependent pair potential, Δ/sub S/(E), the renormalization function Z/sub S/(E), Eliashberg function $\alpha^2F(\omega)$, electron-phonon coupling constant λ and Coulomb pseudopotential μ^*.

33064 Flux-line-cutting threshold in type II superconductors. Clem, J.R.; Yeh, S. (Ames Laboratory: USDOE and Department of Physics, Iowa State University, Ames, Iowa). W-7405-ENG-82. *J. Low Temp. Phys.;* **39**: No. 1, 173-189(Apr 1980).

The threshold for flux-line cutting (intersection and cross-joining of adjacent nonparallel vortices) is considered theoretically for a model array of parallel, equally spaced vortex planes. The vortices within each plane are parallel to each other but are inclined at an angle with respect to vortices in adjacent planes. Forces between vortices are calculated numerically using the interaction force proposed by Brandt, Clem, and Walmsley. Although for small interplanar angles the array is stable, for sufficiently large angles infinitesimal perturbations of the array grow until flux-line cutting occurs.

THEORETICAL PHYSICS

CLASSICAL AND QUANTUM MECHANICS

REFER ALSO TO CITATION(S) 33053

33065 (UCID—18744) **MXLKID: a maximum likelihood parameter identifier.** Gavel, D.T. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Jul 1980. Contract W-7405-ENG-48. 87p. NTIS, PC $8.50.

MXLKID (MaXimum LiKelihood IDentifier) is a computer program designed to identify unknown parameters in a nonlinear dynamic system. Using noisy measurement data from the system, the maximum likelihood identifier computes a likelihood function (LF). Identification of system parameters is accomplished by maximizing the LF with respect to the parameters. The main body of this report briefly summarizes the maximum likelihood technique and gives instructions and examples for running the MXLKID program. MXLKID is implemented LRLTRAN on the CDC7600 computer at LLNL. A detailed mathematical description of the algorithm is given in the appendices. 24 figures, 6 tables.

33066 (UCID—18756) **User's manual for DYNA2D: an explicit two-dimensional hydrodynamic finite element code with interactive rezoning.** Hallquist, J.O. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Jul 1980. Contract W-7405-ENG-48. 82p. NTIS, PC A05/MF A01.

This report provides a user's manual for DYNA2D, an explicit two-dimensional axisymmetric and plane strain finite element code for analyzing the large deformation dynamic and hydrodynamic response of inelastic solids. A contact-impact algorithm permits gaps and sliding along material interfaces. By a specialization of this algorithm, such interfaces can be rigidly tied to admit variable zoning without the need of transition regions. Spatial discretization is achieved by the use of 4-node solid elements, and the equations-of-motion are integrated by the central difference method. An interactive rezoner eliminates the need to terminate the calculation when the mesh becomes too distorted; rather, the mesh can be rezoned and the calculation, continued. The command structure for the rezoner is described and illustrated by an example. 26 figures, 1 table.

RELATIVITY AND GRAVITATION

REFER ALSO TO CITATION(S) 32940

OPTICS

33067 Computation of mode eigenfunctions in graded-index optical fibers by the propagating beam method. Feit, M.D.; Fleck, J.A. Jr. (University of California, Lawrence Livermore Laboratory, Livermore, California 94550). W-7405-ENG-48. *Appl. Opt.;* **19**: No. 13, 2240-2246(1 Jul 1980).

The propagating beam method utilizes discrete Fourier transforms for generating configuration-space solutions to optical waveguide problems without reference to modes. The propagating beam method can also give a complete description of the field in terms of modes by a Fourier analysis with respect to axial distance of the computed fields. Earlier work dealt with the accurate determination of mode propagation constants and group delays. In this paper the method is extended to the computation of mode eigenfunctions. The method is efficient, allowing generation of a large number of eigenfunctions from a single propagation run. Computations for parabolic-index profiles show excellent agreement between analytic and numerically generated eigenfunctions.

STATISTICAL PHYSICS AND THERMODYNAMICS

33068 Mean spherical model for hard ions and dipoles: Thermodynamics and correlation functions. Vericat, F.; Blum, L. (Physics Department, College of Natural Sciences, University of Puerto Rico, Rio Piedras, Puerto Rico). *J. Stat. Phys.;* **22**: No. 5, 593-604(May 1980).

The solution of the mean spherical model of a mixture of equal-size hard ions and dipoles is reinvestigated. Simple expressions for the coefficients of the Laplace transform of the pair correlation function and the other thermodynamic properties are given.

FUSION ENERGY

PLASMA RESEARCH

33069 Brillouin and dielectric sidescatter of 10-μm light by a plasma. Herbst, M.J.; Clayton, C.E.; Chen, F.F. (Electrical Sciences and Engineering Department, University of California, Los Angeles, California 90024). *J. Appl. Phys.;* **51**: No. 8, 4080-4087(Aug 1980).

Sidescatter of CO_2 laser light from underdense, laser-heated plasmas in H_2 and He is observed at $\theta = 90^0$. Spectrum, exponentiation, isotropy, and polarization measurements are used to deconvolve two separate mechanisms: (1) Doppler-shifted reflections from moving dielectric discontinuities created in the laser-ionization process, and (2) Stimulated Brillouin scattering seeded by these reflections. The dielectric sidescatter is unpolarized and azimuthally symmetric, similar to the diffuse component of scattering in solid-target experiments. The Brillouin sidescatter saturates at a low level corresponding to an ion wave amplitude of 0.1—1.0%, consistent with previous data on the saturation of backscatter.

PLASMA CONFINEMENT AND HEATING

REFER ALSO TO CITATION(S) 33106

33070 Plasma heating by an electron beam from a foilless diode. Robertson, S.; Fisher, A. (Physics Department, University of California, Irvine, California 92717). *J. Appl. Phys.;* **51**: No. 8, 4094-4096(Aug 1980).

Intense relativistic electron beams (1 MV, 125 kA, 50 nsec) launched from foil and foilless diodes have been used to heat mirror-confined hydrogen plasmas of density 2×10^{13} and 1.6×10^{14} cm^{-3}. Electrical shorts in the foilless diodes were prevented by locating the diode outside the magnetic mirror in a region of lower plasma density. The plasma heating by the foilless diode was found to be slightly greater than that of the foil diode. This agrees qualitatively with the theory of Thode which predicts that foil scattering decreases the strength of the beam-plasma interaction.

33071 Computer simulation study of waves in bounded plasma with application to lower hybrid heating. Decyk, V.K. Los Angeles, CA; Univ. of California (1977). 253p. University Microfilms Order No.78-06,469.

Thesis (Ph. D.).

Since computer simulation can be a useful tool in understanding complex problems involving boundary conditions, a computer model is developed in chapter one for simulating a bounded plasma slab. The two dimensional electrostatic model is periodic in one dimension and bounded in the other. In the non-periodic dimension, one can specify values of the potential or the normal electric field on both boundaries or one can specify that a vacuum exists outside the plasma, or any combination of these on each boundary. The plasma can be non-neutral.

33072 Experimental investigation of plasma resistivity and ohmic heating in the octupole with toroidal magnetic field. Etzweiler, J.F. Madison, WI; Univ. of Wisconsin (1977). 169p. University Microfilms Order No. 78-00,013.

Thesis (Ph. D.).

Plasma resistivity parallel to the magnetic field in the Wisconsin small octupole with toroidal magnetic field is investigated experimentally. A method is developed to use the flux surface constant, current density divided by magnetic field magnitude, to make possible the measurement of the average resistivity on a flux surface. An heuristic model for resistivity based on the neoclassical effects of Coulomb collisions and particle trapping in the magnetic mirrors is modified to also include neutral collisions and the reduction, caused by the parallel electric field, of mirror trapping. The scaling of resistivity with plasma and field parameters in this model is determined by the collisionality of the plasma with respect to the frequency of an average particle's encounters with the magnetic field maxima. The regimes are collisional, collisionless and intermediate or plateau. The local ohmic heating rate and plasma current density and their integrals over the experiment's volume are calculated.

33073 Low frequency RF heating of plasmas in a toroidal stellarator. Golovato, S.N. Madison, WI; Univ. of Wisconsin (1977). 299p. University Microfilms Order No. 77-28,249.

Thesis (Ph. D.).

Studies of transit-time magnetic pumping and Alfven wave heating have been done in the Proto-Cleo stellarator. Both plasma heating and plasma confinement have been investigated. A traveling wave was launched around the Proto-Cleo l = 2, 6 field period stellarator to attempt transit-time magnetic pumping of a pulsed electron beam moving along the magnetic field lines. An apparent loss of the beam was seen when the transit-time magnetic pumping was applied. A random walk diffusion of the beam electrons with a step size determined by the radial EXB drift due to the poloidal electric field agrees well with the experimental results. Alfven wave heating was applied to plasmas in the Proto-Cleo l = 3, 7 field period stellarator. Global excitation of Alfven waves was accomplished by exciting an electrostatically shielded helical winding corresponding to a q = 3 rational field line with a pulsed, high-power RF source. Theoretical analysis of this helical wave launcher predicted effective energy absorption in the Proto-Cleo gun-produced plasma.

PLASMA DIAGNOSTICS

REFER ALSO TO CITATION(S) 33079

33074 (LA-UR—80-1830) Signal enhancement by spectral equalization of high frequency broadband signals transmitted through optical fibers. Lyons, P.B.; Ogle, J.W.; Holzman, M.A. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 5p. (CONF-800924—1). NTIS, PC A02/MF A01.

From Fiber optics conference; San Francisco, CA, USA (Sep 1980).

A new technique is discussed for enhancing the bandwidth and intensity of high frequency (> 1 GHz) analog, spectrally broad (40 nm) signals transmitted through one kilometer of optical fiber. The existing method for bandwidth enhancement of such a signal uses a very narrow (~ 1 nm) filter between the fiber and detector to limit bandwidth degradation due to material dispersion. Using this method, most of the available optical intensity is rejected and lost. This new technique replaces the narrow-band filter with a spectral equalizer device which uses a reflection grating to disperse the input signal spectrum and direct it onto a linear array of fibers.

33075 (UCID—18636) Program TOMSCAT. Frank, A.M. (California Univ., Livermore (USA). Lawrence Livermore Lab.). 30 May 1980. Contract W-7405-ENG-48. 10p. NTIS, PC A02/MF A01.

Program TOMSCAT is an interactive code that calculates the scattering spectrum and background for a Thomson-scattering diagnostic in typical magnetic fusion plasmas. Thomson scattering yields values of the plasma electron temperature T/sub e/ and electron density N/sub e/. This program is intended as an aid for designing Thomson-scattering systems, so all experimental parameters are input by the user. The code is operational on OCTOPUS.

33076 Spectra of Mo XIII—XVIII from a laser-produced plasma and a low-inductance vacuum spark. Burkhalter, P.G.; Reader, J.; Cowan, R.D. (Naval Research Laboratory, Washington, D.C. 20375). *J. Opt. Soc. Am.;* **70**: No. 8, 912-919(Aug 1980).

The spectrum of Mo from 20 to 90 A was obtained with a laser-produced plasma and a low-inductance vacuum spark. Wavelengths and line identifications were determined for transitions of the type 3d—4p and 3d—4f in Mo XIII—XVI and for 3p—3d type transitions in Mo XVI—XVIII. The line identifications were obtained with the aid of relativistically corrected Hartree-Fock calculations. Energy-level diagrams are given for the $3d^94p$ and $3d^94f$ configurations of Mo XVI.

33077 Evaluation of Nd-glass laser systems for incoherent Thomson scattering diagnostics of low density plasmas. Jacoby, B.A.; York, T.M.; Mollo, R.A. (Pennsylvania State University, University Park, Pennsylvania 16802). EY-76-S-02-4020. *Appl. Opt.;* **19**: No. 13, 2118-2120(1 Jul 1980).

Conventional Thomson scattering using a ruby laser evidences difficulty in scattered signal detection for electron densities $< 10^{15}$ cm^{-3}. Use of Nd-glass laser source in combination with appropriate detectors can result in gains in the resolution of scattered signal of at least 1 order of magnitude over a conventional ruby laser system. However, due to the ~2.5-nm full bandwidth of a Nd-glass laser line, the electron temperature information in the incoherent scattered signal must be extracted from a Voigt profile, not from the usual Gaussian profile as when a ruby laser is used.

PLASMA KINETICS - EXPERIMENTAL

33078 (NRL-Report—8416) XUV aluminum spectra of laser-produced plasmas. Doschek, G.A.; Feldman, U. (Naval Research Lab., Washington, DC (USA)). 15 Jul 1980. 15p. Naval Research Lab., Washington, DC.

XUV aluminum spectra from 200 to 500 A of laser-produced plasmas are discussed. The plasmas were obtained by focusing Nd:glass and CO_2 laser pulses onto planar targets. The spectrograph was a normal incidence instrument without an entrance slit. Therefore monochromatic images of the plasma are formed at the focal plane, rather than spectral lines. Kodak 101 film was used to record the spectra. Images of the plasmas due to transitions in Al V through Al X were identified using a theoretical synthetic aluminum spectrum. The time- and space-integrated relative numbers of the ions from Al V through Al X can be obtained from a comparison of the synthetic and laser-plasma spectra. The comparison enables determi-

nation of the film calibration curve and the efficiency of the instrument with wavelength. The morphology of the expansion of the plasma is also discussed. The plasma of the highest temperature ions (Al X) expands outward in cylindrically shaped structures. The expansion of the lower temperature plasma (such as Al VII) is also cylindrical in appearance, but the images are not as tightly confined to the target normal as for the hotter ions.

33079 (UCRL—52751) **Extreme ultraviolet diagnosis of a neutral-beam-heated mirror machine.** Drake, R.P. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Jul 1980. Contract W-7405-ENG-48. 187p. NTIS, PC A09/MF A01.

Extreme ultraviolet emissions from the LLL 2XIIB fusion research experiment have been studied. (2XIIB was a magnetic-mirror-plasma-confinement device; beams of high-energy (20 keV) neutral deuterium created a high-density, high-temperature plasma.) A normal-incidence concave-grating monochromator, equipped with a windowless photomultiplier tube, was used to measure emissions in the spectral region from 400 Angstrom to 1600 A. Emissions of oxygen, titanium, carbon, nitrogen, and deuterium were identified; the oxygen brightnesses at times exceeded 10^{18} ph-s^{-1}-cm^{-2}-sr^{-1}. A survey of the emission characteristics found the oxygen concentration was 3%, the other impurities had concentrations near 0.4%. The radiated power loss was about 5% of the deposited neutral beam power.

PLASMA KINETICS - THEORETICAL

33080 (AD-A—076121) **Evolution of turbulence by three-dimensional numerical particle-vortex tracing.** Couet, B. (Stanford Univ., CA (USA). Inst. for Plasma Research). Aug 1979. Contract N00014-78-C-0272. 190p. NTIS, PC A09/MF A01.

A new method for the numerical simulation of three-dimensional incompressible flows is described. Our vortex-in-cell (VIC) method traces the motion of the vortex filaments in the velocity field which these filaments create. The velocity field is not calculated by creating a mesh-record of the vorticity field, then integrating a Poisson's equation via the fast Fourier transform to get the stream function and generating a mesh-record of the velocity field. The computed scales of motion are assumed to be essentially inviscid. Viscous or subgrid-scale effects are incorporated into a filtering procedure in wave vector space. Three computational experiments were pursued in three-dimensional space. The velocity of translation of a single vortex ring was measured and compared with the Biot-Savart law. Next, the evolution in time of an infinite periodic array of closed vortex filaments (Taylor-Green) was studied. The third simulation follows a mixing layer from an initial state of uniform vorticity with two- and three-dimensional small perturbations. Streamwise perturbations lead to the usual roll-up of vortex patterns with spanwise uniformity.

33081 (COO—2218-154) **One-dimensional thermonuclear burn computations for the Reversed-Field Pinch Reactor (RFPR).** Nebel, R.A.; Miley, G.H.; Moses, R.W. (Illinois Univ., Urbana (USA). Fusion Studies Lab.). 1980. Contract AS02-76ET52040. 31p. NTIS, PC A03/MF A01.

Conceptual fusion reactor designs of the Reversed-Field Pinch Reactor (RFPR) have been based on profile-averaged zero-dimensional (point) plasma models. The plasma response/performance that has been predicted by the point plasma model is re-examined by a comprehensive one-dimensional (radial) burn code (RFPBRN) that has been developed and parametrically evaluated for the RFPR. The RFPR plasma parameters have been optimized and effects of turbulent transport and stability have been studied.

33082 (COO—2218-164) **User's guide for RFPBRN, a one-dimensional transport and stability code.** Nebel, R.; Miley, G.H. (Illinois Univ., Urbana (USA)). Jun 1980. Contract AS02-76ET52040. 14p. NTIS, PC A02/MF A01.

RFPBRN is a one-dimensional, Lagrangian mesh, transport and stability code for Reverse Field Pinch reactors. The code employs the quasi-static approximation (ignores the inertial terms in the momentum transport equation) to follow the evolution of a plasma on a resistive time scale. The transport equations used are particle transport, energy transport and field diffusion. The model has three fluids (ions, electrons and alphas), two temperatures (ions and alphas are assumed to immediately equilibrate), and two field components (toroidal and poloidal).

33083 (DOE/DP/40032—2) **Non-linear theory of laser-plasma interactions.** Liu, C.S. (Maryland Univ., College Park (USA). Dept. of Physics and Astronomy). 1980. Contract AS05-77DP40032. 5p. NTIS, PC A02/MF A01.

Research progress on each of the following areas is briefly described: (1) optical ray retracing of Brillouin backscattering from a nonisothermal plasma; (2) electromagnetic oscillating two-stream instability of laser radiation; (3) second harmonic generation of upper hybrid radiation in a plasma; (4) nonlinear scattering of upper hybrid laser radiation by electron Bernstein modes in a plasma; and (5) destructive collisions of supersonic solitons. (MOW)

33084 (LA-UR—80-2220) **Alpha-particle considerations relevant to the Reversed-Field Pinch Reactor (RFPR).** Miller, R.L. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 6p. (CONF-800484—3). NTIS, PC A02/MF A01.

From Reversed field pinch theory workshop; Los Alamos, NM, USA (28 Apr 1980).

A primer on alpha-particle fundamentals as they relate to the conceptual design of the Reversed-Field Pinch Reactor (RFPR) is presented. A call for more research in this area is made.

33085 (PPPL—1680) **Influence of stochastic magnetic fields on the confinement of runaway electrons and thermal electron energy in tokamaks.** Mynick, H.E.; Strachan, J.D. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1980. Contract AM02-76CH03073. 33p. NTIS, PC A03/MF A01.

The ratio of the runaway electron confinement to thermal electron energy confinement is derived for tokamaks where both processes are determined by free streaming along stochastic magnetic field lines. The runaway electron confinement is enhanced at high runaway electron energies due to phase averaging over the magnetic perturbations when the runaway electron drift surfaces are dislaced from the magnetic surfaces. Comparison with experimental data from LT-3, ORMAK, PLT, ST, and TM-3 indicates that magnetic stochasticity may explain the relative transport rates of runaways and thermal electron energy.

33086 (PPPL—1687) **Simultaneous accelerated relaxation method for elliptic equations.** Jardin, S.C.; Miller, A. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1980. Contract AM02-76CH03073. 7p. NTIS, PC A02/MF A01.

A simple physically motivated iterative method is presented for solving elliptic equations. The method is shown to coverge 3 to 4 times as fast as the optimal SOR method when implemented on the CRAY-I computer.

33087 (PPPL—1691) **Sufficient condition for velocity-space stability of the alpha particle distribution in a tokamak reactor.** Cordey, J.G.; Goldston, R.J.; Mikkelsen, D.R. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Aug 1980. Contract AM02-76CH03073. 27p. NTIS, PC A03/MF A01.

A condition is derived for the velocity-space distribution of suprathermal alpha particles to be monotonically decreasing with energy - and hence stable to homogeneous plasma instabilities - during the heating phase of a tokamak reactor. This stability condition is easily satisfied for presently envisaged neutral injection heating of reactors, but may be violated in strong heating of smaller plasmas or during fast compressional heating.

33088 **Fusion through metallic deuterium. II.** Liboff, R.L. (Cornell Univ., Ithaca, NY (USA). School of Electrical Engineering). *Phys. Lett., A;* **74**: No. 5, 323-324(26 Nov 1979).

The possibility of attaining $^2H(^2H,n)^3He$ fusion in the metallic phase of deuterium is examined further. This scheme is based on the finite valuedness of the radial distribution at zero argument for an aggregate of charged bosons in a neutralizing background. Large deuteron wavefunction overlap is theoretically implied in the stable metallic liquid phase at rsub(s)<approximately 0.21.

33089 **Numerical solution of the drift kinetic equation.** Santarius, J.F. Austin, TX; Univ. of Texas (1979). 93p. University Microfilms Order No. 79-20,201.

Thesis (Ph. D.).

The non-adiabatic part of the electron distribution in toroidal geometry is investigated through numerical solution of the drift kinetic equation in various parameter regions. A Lorentz operator is used to model collisions for both trapped and untrapped electrons, thus including angle scattering for all of velocity space. Both poloidal and pitch angle dependence of the electron magnetic curvature and gradient drifts are included without the necessity of bounce averaging. No special boundary conditions are used at the trapped-untrapped electron boundary. A preconditioned conjugate gradient technique is used to solve the drift kinetic equation. The result is used in a dispersion relation which includes ion inertia and ion Landau damping to find growth rates for the dissipative trapped electron mode in the radially local case. Comparisons are made to results from simpler approximations such as the Krook model. The effects of magnetic curvature and gradient drifts are examined, as is the dependence of growth rates and distribution functions on collision frequency.

33090 **Dynamics and consequences of runaway electrons in tokamak plasmas.** Mok, Y. Baltimore, MD; Univ. of Maryland (1978). 152p. University Microfilms Order No. 79-20,724.

Thesis (Ph. D.).

The electron distribution function in tokamak plasmas is investigated using the Fokker-Planck equation. To obtain a physically meaningful disribution the original Fokker-Planck equation is

modified to take into account particle loss so that the distribution function is normalizable when boundary conditions are imposed. A different approach is used to determine the normalization in order to avoid using the ambiguous part of the distribution that has been crudely approximated. A slow-varying (in time) distribution as well as a steady one is found.

33091 **Neutral atom transport in tokamak plasmas by multigroup discrete ordinates methods.** Gilligan, J.G. Ann Arbor, MI; Univ. of Michigan (1977). 187p. University Microfilms Order No. 78-04,708. Thesis (Ph. D.).

The numerical calculations consist of two parts: the generation of the neutral multigroup cross sections, and the transport equation solutions. A code, GIMUXS, was written to provide multigroup cross section libraries for the standard MGDO transport code ANISN. It is found that ANISN can treat all important aspects of neutral transport. From the results of a parameter survey a standard operating procedure is arrived at for neutral transport problems. Of particular interest are the neutral profiles generated as an integral part of larger plasma system simulation codes. To determine the appropriateness of utilizing ANISN for this purpose, results are compared with the neutral transport module of the Duechs plasma code. For a typical TFTR plasma, predicted neutral densities differ by a maximum factor of three on axis and outfluxes at the plasma boundary by ~ 40%. This is found to be significant for a neutral transport module. Possible sources of the observed discrepancies are indicated from an analysis of the approximations used in the Duechs model.

PLASMA INSTABILITIES

33092 (AD-A—076154) **Electromagnetic instabilities in a focused ion beam propagating through a z-discharge plasma. Interim report.** Ottinger, P.F.; Mosher, D.; Goldstein, S.A. (Naval Research Lab., Washington, DC (USA)). 15 Oct 1979. Contract ES-77-A-01-6021. 26p. NTIS, PC A03/MF A01.

A beam-plasma system consisting of a focused light ion beam propagating through a z-discharge plasma is analyzed for electromagnetic velocity space instabilities. In particular, the Weibel and the Whistler instabilities are studied. It is found that unstable modes do not grow fast enough to affect the beam propagation in a pellet-fusion-reactor chamber.

33093 (ORNL/TM—6880) **Equilibrium and ballooning mode stability of an axisymmetric tensor pressure tokamak.** Cooper, W.A.; Bateman, G.; Nelson, D.B.; Kammash, T. (Oak Ridge National Lab., TN (USA)). Aug 1980. Contract W-7405-ENG-26. 53p. NTIS, PC A04/MF A01.

A force balance relation, a representation for the poloidal beta (β/sub p/), and expressions for the current densities are derived from the MHD equilibrium relations for an axisymmetric tensor pressure tokamak. Perpendicular and parallel beam pressure components are evaluated from a distribution function that models high energy neutral particle injection. A double adiabatic energy principle is derived from that of Kruskal and Oberman, with correction terms added. The energy principle is then applied to an arbitrary cross-section axisymmetric tokamak to examine ballooning instabilities of large toroidal mode number. The resulting Euler equation is remarkably similar to that of ideal MHD. Although the field-bending term is virtually unaltered, the driving term is modified because the pressures are no longer constant on a flux surface. Either a necessary or a sufficient marginal stability criterion for a guiding center plasma can be derived from this equation whenever an additional stabilizing element unique to the double adiabatic theory is either kept or neglected, respectively.

33094 (ORNL/TM—7324) **Finite Larmor radius stabilization of ballooning modes in tokamaks.** Tsang, K.T. (Oak Ridge National Lab., TN (USA)). Jul 1980. Contract W-7405-ENG-26. 26p. NTIS, PC A03/MF A01.

A ballooning mode equation that includes full finite Larmor radius effects has been derived from the Vlasov equation for a circular tokamak equilibrium. Numerical solution of this equation shows that finite Larmor radius effects are stabilizing.

33095 **Resistive diffusion of a high-β flux-conserving equilibrium.** Charlton, L.A.; Nelson, D.B.; Dory, R.A. (Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830). W-7405-ENG-26. *Phys. Rev. Lett.;* **45**: No. 1, 24-27(7 Jul 1980).

The stability of a high-β flux-conserving-tokamak equilibrium during resistive magnetic flux diffusion has been studied with use of a fully toroidal transport-equilibrium model coupled to ideal magnet hydrodynamic stability codes. With broad temperature profiles, the stabiltiy of beta-bar=10% equilibria to all ideal magnetohydrodynamic modes can be maintained for as long as the external transformer can supply volt seconds. With narrower temperature profiles, instability may result during the diffusion, but even for these, stability can be reestablished in resistive steady state.

PLASMA WAVE PHENOMENA

REFER ALSO TO CITATION(S) 33083

33096 (COO—4631-11) **Experimental test of resonant absorption theory. Final report, January 1, 1978-December 31, 1979.** Yablonovitch, E. (Harvard Univ., Cambridge, MA (USA). Div. of Applied Sciences). May 1979. Contract AS02-78DP40018. 15p. NTIS, PC A02/MF A01.

This experimental research has probed the nature of resonant absorption (RA) of laser light by laser-produced plasmas. The plasmas were created by optical breakdown of a shockfront produced in an electrothermal shock tube. This procedure allows the density structure of the plasma, and in particular, the orientation of the plasma critical-density surface, to be reproducibly formed from one shot to the next. Thus, for the first time, RA has been controllably and reproducibly studied in isolation from other plasma physics. The angular distribution of fast electrons emitted by RA and wavebreaking has been studied, and it is observed that the emission is directed in a narrow cone centered on the shockfront density-gradient vector, in agreement with the theory of wavebreaking.

33097 **Calculation of turbulent diffusion for the Chirikov-Taylor model.** Rechester, A.B.; White, R.B. (Plasma Fusion Center, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139). EY-76-C-02-3073;DE-AS02-78ET53074. *Phys. Rev. Lett.;* **44**: No. 24, 1586-1589(16 Jun 1980).

A probabilistic method for the solution of the Vlasov equation has been applied to the Chirikov-Taylor model. The analytical solutions for the probability function and its second velocity moment have been obtained. Good agreement between the theory and numerical computations has been found.

33098 **Momentum transfer from waves to particles.** Schmidt, G. (Stevens Inst. of Tech., Hoboken, NJ (USA). Dept. of Physics and Engineering Physics). *Phys. Lett., A;* **74**: No. 3-4, 222-224(12 Nov 1979).

Momentum transfer from an electromagnetic or electrostatic wave to an electron is calculated in the presence of friction, and it is shown that it can be comparable to the one obtained from the ponderomotive force.

FUSION POWER PLANT TECHNOLOGY

REFER ALSO TO CITATION(S) 32266, 32320

33099 (ANL/FPP—79-3, pp 45-74) **STARFIRE: a commercial tokamak reactor design study.** Feb 1980.

In Fusion Power Program biannual progress report, April-September 1979.

The following areas of the STARFIRE program are discussed: (1) overview of the reference design, (2) first wall/blanket materials options, (3) neutronics, (4) tritium and safety considerations for the first wall and blanket, and (5) maintenance of STARFIRE. (MOW)

33100 (LA—8448-MS) **Conceptual physics design of a compact torus fusion reactor (CTOR).** Hagenson, R.L.; Krakowski, R.A. (Los Alamos Scientific Lab., NM (USA)). Jul 1980. Contract W-7405-ENG-36. 56p. NTIS, PC A04/MF A01.

The general approach to fusion power embodied by field-reversed plasmoid configurations is reviewed within the context of a power reactor. A simple analytic formulation is developed and applied to the field-reversed theta pinch as a core plasma for a thermonuclear reactor. These calculations and results are based on a minimum power constraint and will serve as a basis for more exact and detailed reactor modeling.

33101 (LA-UR—80-2219) **Physics considerations of the Reversed-Field Pinch fusion reactor.** Hagenson, R.L.; Krakowski, R.A. (Science Applications, Inc., Ames, IA (USA); Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 7p. (CONF-800484—4). NTIS, PC A02/MF A01.

From Reversed field pinch theory workshop; Los Alamos, NM, USA (28 Apr 1980).

A conceptual engineering design of a fusion reactor based on plasma confinement in a toroidal Reversed-Field Pinch (RFP) configuration is described. The plasma is ohmically ignited by toroidal plasma currents which also inherently provide the confining magnetic fields in a toroidal chamber having major and minor radii of 12.7 and 1.5 m, respectively. The DT plasma ignites in 2 to 3 s and undergoes a transient, unrefueled burn at 10 to 20 keV for ~ 20 s to give a DT burnup of ~ 50%. Accounting for all major energy sinks yields a cost-optimized system with a recirculating power fraction of 0.17; the power output is 750 MWe(net).

33102 (PPPL—1693) **Ignition in a tokamak reactor with INTOR-like parameters.** Singer, C.E.; Seidl, F.G.P.; Post, D.E.; Rutherford, P.H. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Aug 1980. Contract AM02-76CH03073. 43p. NTIS, PC A03/MF A01.

The requirements for ignition in a tokamak reactor with INTOR-like parameters were studied using a one-dimensional transport code. With empirical electron energy diffusivity Chi/sub e/, ignition was obtained with 60 to 75 MW of neutral beam injection at a volume average pressure ratio $<\beta> = 4$ to 5% under a variety of conditions. Charging Chi/sub e/ gave ignition at the same $<\beta>$ if the plasma minor radius varied as a proportional to Chi/sub e/sup 1/2/. The maximum impurity concentration which allows ignition was found to be comparable to that for the much simpler case of a homogeneous plasma with radiative losses only. In long pulse simulations with efficient helium pumping, the maximum toroidal field ripple which allowed ignition was 2.0% (peak to peak) at the plasma edge. Ignition was maintained with over 99% recycling of helium ash using 5% less than maximum ripple.

33103 **Mirror fusion reactor design.** Neef, W.S. Jr.; Carlson, G.A. (California Univ., Livermore (USA). Lawrence Livermore Lab.). *J. Nucl. Mater.;* **85**: No. 86, 17-28(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

The major differences between mirror and toroidal fusion systems are described. Mirror optimization leading to 'tandem' and 'field reversed' systems results in enhanced plasma efficiency and reactor power balance. Blanket designs are reviewed which depend on a mirror's simple axisymmetric geometry. Coolants are discussed and pressurized helium favored for mirror reactors. Materials problems of both the first wall and neutral beam sources are reviewed along with neutron thermal loads on cryopanel pumps and direct converters. Superconducting magnets may have to be made of niobium-tin due to high field strength requirements. Recent data supporting Nb-Sn's use is included. Quadrupole fields require unusual magnet designs.

BLANKET ENGINEERING

33104 **Evaluation of materials for EPR power generation.** Mattas, R.F.; Stevens, H.C.; Misra, B. (Argonne National Lab., IL (USA)). *J. Nucl. Mater.;* **85**: No. 86, 171-175(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

The blanket materials employed for heat generation in the Argonne Experimental Power reactor (EPR) are evaluated. The EPR blanket consists of annealed type 316 stainless steel sections cooled by pressurized water and Inconel 718 sections cooled by steam. The predicted life-times of the two different blanket sections is approximately 2 years of normal operation for the Inconel 718 sections and approximately 3.5 years for type 316 stainless steel sections. The lifetime of annealed type 316 stainless steel is limited by swelling considerations, while the lifetime of Inconel 718 is limited by ductility considerations.

33105 **Mechanical analysis of a first wall model by using a state variable approach.** Mukherjee, S. (Cornell Univ., Ithaca, NY (USA). Dept. of Theoretical and Applied Mechanics); Harkness, S.D. (Argonne National Lab., IL (USA)); Li, C.Y. (Cornell Univ., Ithaca, NY (USA). Dept. of Materials Science and Engineering). *J. Nucl. Mater.;* **85**: No. 86, 183-187(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

A first wall design of modular cylindrical cell type with each cell enclosed by a spherical cap is considered. Detailed inelastic stress analysis is performed for the spherical cap by using constitutive equations based on state variables. The analysis calculates the inelastic response of the spherical cap to prescribed internal pressure and time-varying temperature through the thickness and yields the stress, strain and strain rate as functions of position and time. The effect of maximum temperature and irradiation creep on the relaxation of peak stress with cycles is determined and the calculated stress and strain distributions are used as a basis for the development of failure criteria for design.

MAGNET COILS AND FIELDS

REFER ALSO TO CITATION(S) 32584

33106 (PPPL—1684) **Current generation by minority species heating.** Fisch, N.J. (Princeton Univ., NJ (USA). Plasma Physics Lab.). Jul 1980. Contract AM02-76CH03073. 28p. NTIS, PC A03/MF A01.

It is proposed that electric currents be generated from the preferential heating of ions traveling in one direction but with no net momentum injected into the system. This can be accomplished with, for example, traveling waves in a two-ion-species plasma. The current can be generated efficiently enough for the scheme to be of interest in maintaining steady-state toroidal currents in a reactor.

33107 (UCID—18490) **Currents and voltages in the MFTF coils during the formation of a normal zone.** Owen, E.W. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Aug 1980. Contract W-7405-ENG-48. 28p. NTIS, PC A03/MF A01.

Expressions are obtained for the currents and voltages in a pair of inductively coupled superconducting coils under two conditions: formation of a normal zone and during a change in the level of the current in one coil. A dump resistor of low resistance and a detector bridge is connected across each coil. Calculated results are given for the MFTF coils. The circuit equations during formation of a normal zone are nonlinear and time-varying, consequently, only a series solution is possible. The conditions during a change in current are more easily found. After the transient has died away, the voltages in the coil associated with the changing source are all self-inductive, while the voltages in the other coil are all mutually inductive.

33108 (UWFDM—361) **Design procedure of the central cell solenoids for the tandem mirror reactor WITAMIR-I.** Maurer, W.; Larbalestier, D.C.; Sviatoslavsky, I. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). May 1980. Contract AS02-78ET52048. 21p. NTIS, PC A02/MF A01.

The central cell field of the tandem mirror reactor (TMR) will be achieved with discrete solenoids spaced at regular intervals to provide space for feeding and diagnostic devices. The solenoids are superconducting and operate in a steady dc mode. To provide long term operation, the solenoid will be designed for cryostatically stable operation.

33109 (UWFDM—362) **Collisionless plasma flow through a decreasing magnetic field.** Bailey, A.W.; Emmert, G.A. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). Jul 1980. Contract AS02-78ET52048. 13p. NTIS, PC A02/MF A01.

Plasma flowing through a decreasing magnetic field, as in a bundle divertor, experiences a drop in potential. The decrease is calculated using a 1-D model in which the ion distribution is calculated self-consistently. This is compared with the results of an earlier model developed for bundle divertors; the two solutions are in good agreement for usual values of the mirror ratio. This calculation, however, gives a continuous, well-behaved solution as the mirror ratio approaches unity, whereas the previous model gave a discontinuous result.

33110 **Cryogenic radiation effects on electric insulators.** Kernohan, R.H.; Long, C.J.; Coltman, R.R. Jr. (Oak Ridge National Lab., TN (USA)). *J. Nucl. Mater.;* **85**: No. 86, 379-383(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

The radiation allowable at the superconducting magnets of a fusion reactor may be limited by the radiation tolerance of organic and composite electrical insulators. The allowable dose at the magnets will in turn influence the thickness of shielding necessary and therefore the size of the magnets. The response of organic substances to radiation at 4 K cannot be confidently predicted from irradiations at higher temperatures. Therefore, epoxy-based, polyamide, and polyimide insulators chosen from superconducting magnet practice were irradiated in liquid helium to a total gamma dose of 20 MGy (2 x 10^9 rd). Electrical resistivity was measured during and after irradiation and electrical breakdown was measured after irradiation. Mechanical properties measured at 77 K after irradiation included flexure strength, shear strength (of adhesives between copper), and compressive strength. Electrical properties were generally degraded, but the materials should still be useful as insulators. Mechanical strengths, however, were sufficiently decreased to require re-evaluation of some designs. Aluminized Mylar (superinsulation) was severely embrittled.

POWER SUPPLIES, ENERGY STORAGE

33111 (LA-UR—80-2072) **Vacuum switchgear for fusion experiments.** Parsons, W.M. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 9p. NTIS, PC A02/MF A01.

A frequently encountered switch application is the interruption of a high level, pulsed, dc current followed by a fast rising recovery voltage. A 7 in. vacuum interrupter with an axial magnetic field has proven to be an effective switch for currents up to 25 kA. Beyond 25 kA, a parallel configuration becomes necessary. The influence of the axial magnetic field on the behavior of parallel vacuum interrupters and test results up to 50 kA are discussed. Also, test results on experimental devices with novel electrode geometries such as the rod-array vacuum interrupter and the Amsler contact interrupter are presented. Interrupters which can carry large dc currents on a continuous basis are frequently required in fusion applications. This requirement occurs in superconducting coil protection circuits and generally involves recovery voltages of 5 kV or less. A specially designed vacuum interrupter with water cooled

electrodes has been used to extend the continuous current rating of a commercial interrupter from 1200 A to 13 kA. Two second generation devices with special electrode materials are currently being developed for use with a special actuator and are intended to extend the continuous rating to 25 kA.

33112 (LA-UR—80-2078) **Electromechanical shock in pulse power components.** Burkes, T.R.; Sarjeant, W.J. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 9p. (CONF-800640—17). NTIS, PC A02/MF A01.

From 14. pulse power modulator symposium; Orlando, FL, USA (3 Jun 1980).

Most components used in high power pulse generators undergo mechanical shock stresses during the pulse or on its leading edge. As power densities become very high, this shock may lead to anomalous behavior as well as introduce failure modes that may not be immediately obvious. It has been shown that acoustic shock waves traveling within spark gap electrodes can affect electrode erosion by as much as an order of magnitude. Thus, a new point of view is required for component design where shock may be a critical factor. The mechanisms for generation of shock forces, both thermal and electromagnetic, are reviewed and applied to resistors, capacitors, magnetic devices and switches. The mechanisms described are square law effects so that it can be concluded that for high energy pulses, mechanical shock stress will be a critical factor in component survival.

COOLING SYSTEMS

REFER ALSO TO CITATION(S) 33126

HEATING AND FUELING SYSTEMS

33113 (BNL—28076) **Advanced, high energy neutral beam injector.** Alessi, J.; Fink, J.; Maschke, A.; Prelec, K.; Sluyters, T. (Brookhaven National Lab., Upton, NY (USA)). 1980. Contract AC02-76CH00016. 6p. (CONF-800932—1). NTIS, PC A02/MF A01.

From 2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas; Como, Italy (3 Sep 1980).

The BNL design of a high energy neutral beam injector is based on the neutralization of negative ions, a process that remains very efficient even at energies up to and above 1 MeV. The principal elements of such an injector are: source of negative ions, beam extraction and transport system, accelerator, neutralizing cell, and system for the removal and dumping (or energy recovery) of the remaining charged components of the beam. Among several possible source geometries, the most advanced is the BNL version of the magnetron. Best results have been obtained by using geometrical focusing of surface produced H^- ions and an asymmetric discharge chamber. A large water cooled model is being fabricated, to deliver 1-2 A of H^-/D^- beam currents in pulses longer than 5 s, with a source power efficiency of about 6 kW/A and a gas efficiency of 6-10%. First tests are scheduled for July 1980. Two options of the beam transport are being studied theoretically and experimentally: a weak focusing bending magnet and a strong focusing chain of electrostatic quadrupoles.

33114 (BNL—51193) **BNL neutral beam development group. Progress report, FY 1979.** Prelec, K.; Sluyters, T. (Brookhaven National Lab., Upton, NY (USA)). 15 Jan 1980. Contract AC02-76CH00016. 12p. NTIS, PC A02/MF A01.

The objective of the BNL Neutral Beam Program is to develop a 250 keV neutral beam system suitable for heating experiments in toroidal or mirror plasma devices. The system will be based on acceleration and neutralization of negative hydrogen ions produced in and directly extracted from a source. The objective of source studies is to develop a unit delivering 10 A of negative ion currents in pulses of 1 s duration or longer, operating with extracted current densities of at least 0.5 A/cm^2 and having acceptable power and gas efficiencies and good beam optics. The 250 keV accelerator development work covers different structures, including those separated from the source by a bending magnet or a beam transfer system. During FY 1979 substantial progress was achieved toward the objectives of the program; in the same period the BNL program was reviewed by a panel, resulting in suggestions for a better orientation toward prospective users' requirements and in establishment of contacts with Princeton Plasma Physics Laboratory (TFTR Project) and Lawrence Berkeley and Livermore Laboratories (MFTF Project). A cooperative effort with Westinghouse was initiated in the second half of FY 1979 in order to utilize industrial facilities and expertise.

33115 (LBL—11261) **Neutral beam source commercialization study. Final report.** King, H.J. (Hughes Research Labs., Malibu, CA (USA)). Jun 1980. Contract W-7405-ENG-48. 70p. NTIS, PC A03/MF A01.

The basic tasks of this Phase II project were to: generate a set of design drawings suitable for quantity production of sources of this design; fabricate a functional neutral beam source incorporating as many of the proposed design changes as proved feasible; and document the procedures and findings developed during the contract. These tasks have been accomplished and represent a demonstrated milestone in the industrialization of this complete device.

33116 (NRL-MR—4213) **Tokamak heating and current maintenance with intense pulsed ion beams.** Manheimer, W.M.; Winsor, N.K. (Naval Research Lab., Washington, DC (USA)). 21 Aug 1980. Contract AI01-76ET53020. 63p. NTIS, PC A04/MF A01.

This paper examines tokamak heating with intense pulsed ion beams. It finds that plasma can be heated to ignition or to $Q \sim 1$ and depending on the injection scheme, the current can be maintained or even generated by the beam.

TRITIUM PROCESSING, ENVIRONMENT AND SAFETY

REFER ALSO TO CITATION(S) 32240

33117 (ANL/FPP—79-3, pp 75-101) **Fusion systems engineering.** Baker, C.C.; Bolon, A.; Clemmer, R.; Evans, K. Jr.; Jung, J.; Turner, L.; Blue, T.; Driemeyer, D.; Metzger, J.; Miley, G. Feb 1980.

In Fusion Power Program biannual progress report, April-September 1979.

The topics covered in this section include: (1) fusion systems engineering, (2) fusion energy applications, (3) environment and safety, (4) magnet systems, and (5) applied plasma theory. (MOW)

INERTIAL CONFINEMENT TECHNOLOGY

REFER ALSO TO CITATION(S) 31718, 33092

33118 (LA—7587-PR) **Inertial fusion program. Progress report, January 1-June 30, 1978.** Skoberne, F. (comp.). (Los Alamos Scientific Lab., NM (USA)). May 1980. Contract W-7405-ENG-36. 198p. NTIS, PC A09/MF A01.

Studies and experiments aimed at investigating the possibility of restoring wavefront quality in optical systems through phase conjugation are summarized, and work that could lead to the development of highly damage-resistant isolators is discussed. The effects of various parameters on pulse-energy uniformity and of multipass extraction on laser efficiency are reported. Results of equation-of-state, shock propagation, multiburst simulation, and opacity measurements are discussed. Target designs are described that should provide a smooth transition from the exploding-pusher regime of experiments to that of isentropic compression. Progress in target fabrication techniques toward creating a 20-times-liquid-density target are outlined, and efforts that led to the extension of our neutron detection capability to levels of less than 10^9 n are summarized. The results of various studies of laser fusion application, e.g., for producing ultrahigh-temperature process heat or hydrogen from water decomposition are presented, as well as investigations of fusion-fission hybrids for the production of ^{233}U from ^{232}Th.

33119 (LA-UR—80-1885) **Alignment and focusing device for a multibeam laser system.** Sweatt, W.C. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 5p. (CONF-800719—10). NTIS, PC A02/MF A01.

From International symposium of the Society of Photo-Optical Instrumentation Engineers; San Diego, CA, USA (28 Jul 1980).

Large inertial confinement fusion laser systems have many beams focusing on a small target. The Antares system is a 24-beam CO_2 pulse laser. To produce uniform illumination, the 24 beams must be individually focused on (or near) the target's surface in a symmetric pattern. To assess the quality of a given beam, we will locate a Smartt (point diffraction) interferometer at the desired focal point and illuminate it with an alignment laser. The resulting fringe pattern shows defocus, lateral misalignment, and beam aberrations; all of which can be minimized by tilting and translating the focusing mirror and the preceding flat mirror. The device described in this paper will remotely translate the Smartt interferometer to any position in the target space and point it in any direction using a two-axis gimbal. The fringes produced by the interferometer are relayed out of the target vacuum shell to a vidicon by a train or prisms. We are designing four separate snap-in heads to mount on the gimbal; two of which are Smartt interferometers (for 10.6 μm and 633 nm) and two for pinholes, should we wish to put an alignment beam backwards through the system.

33120 (NRL-MR—4309) **Beam nonuniformity effects on laser ablatively accelerated targets.** Obenschain, S.P.; Lehmberg, R.H.; Ripin, B.H. (Naval Research Lab., Washington, DC (USA)). 20 Aug 1980. Contract AI01-77DP40042. 13p. NTIS, PC A02/MF A01.

Results are presented of a laser doppler shift technique which gives the velocity profiles of ablatively accelerated targets. Measurements of the effects of laser beam nonuniformity on the target acceleration are presented and interpreted in the context of laser pellet fusion.

33121 (NVO—1555-5) **Development of fluorides for high power laser optics. Final report, 1 April 1978-31 March 1980.** Ready, J.F.; Vora, H. (Honeywell Corporate Material Sciences Center, Bloomington, MN (USA)). Jul 1980. Contract AC08-78DP40020. 54p. NTIS, PC A04/MF A01.

The following optical properties of both single-crystal and press-forged LiF were evaluated in the program: optical homogeneity at 633 nm, stress birefringence, scattering at 633 nm, residual absorption over the spectral range 339 to 3800 nm, and laser damage thresholds for 1-ns, 1064-nm and 700-ps, 266-nm laser pulses. The results of the optical characterization tasks indicate that LiF single crystals can be press-forged without seriously degrading their optical properties. The following mechanical properties of both single-crystal and press-forged LiF were evaluated: yield strength in compression, proportional limit and fracture strength in 3- and 4-point bending, fracture energy, and threshold for microyield. The results indicate that the mechanical properties of LiF single crystals can be improved significantly by press forging.

33122 (SAND—80-1358C) **Self-magnetically insulated electron flow in vacuum transmission lines.** VanDevender, J.P.; Crow, J.T.; Epstein, B.G.; McDaniel, D.H.; Mendel, C.W. Jr.; Neau, E.L.; Poukey, J.W.; Quintenz, J.P.; Seidel, D.B.; Stinnett, R.W. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 46p. (CONF-800923—3). NTIS, PC A03/MF A01.

From 9. international symposium on discharges and electrical insulations in vacuum; Eindhoven, Netherlands (16 Sep 1980).

The properties of the electron flow in self magnetically-insulated vacuum transmission lines are investigated. Experiments and analysis of three basic types of transitions in magnetically insulated lines indicate that beam effects dominate the power transport and electron stability. Faraday cup measurements of the loss current density to the anode show the usual electron component during the rise of the voltage and also a residual loss from negative ions. This low level loss current persists over a small fraction of the total electrode area after the electrons are insulated. The characteristics of the loss are strongly affected by how the plasma is formed.

33123 (SAND—80-7001) **First wall and cavity design studies for a light ion beam driven fusion reactor.** Moses, G.A.; Abdel-Khalik, S.I.; Drake, D. (Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering). Aug 1980. Contract AC04-76DP00789. 87p. NTIS, PC A05/MF A01.

Cavity and first wall designs for light ion beam fusion reactors are reported. This effort includes parametric analysis of the cavity gas response as a function of the gas temperature and gas type, the first wall mechanical response as a function of the wall material and structural design, the first wall thermal response as a function of cavity gas type and wall thickness. Also included are neutronics and time dependent radiation damage studies of the first wall, taking account of neutron interactions in the pellet. There is an assessment of the cavity gas recirculation system with possible design alternatives. A novel cavity design that utilizes the effect of blast waves in a gas with a strong density gradient is introduced. Basic conclusions regarding the viability of conservative cavity design options are listed.

33124 Scaling of ablative laser-fusion implosions. Max, C.E.; McKee, C.F.; Mead, W.C. (Lawrence Livermore Laboratory, Livermore, California 94550). W-7405-ENG-48. *Phys. Rev. Lett.;* **45**: No. 1, 28-31(7 Jul 1980).

A theoretical model is presented describing the spatial structure and scaling laws of laser-driven ablative implosions. The effect of inhibited electron thermal transport is explicitly included. Simple expressions describe the ablation rate and pressure as a function of laser intensity and wavelength. The analytic results are supported by extensive comparisons with numerical hydrodynamic simulations.

33125 Compression of polymer-coated laser-fusion targets to ten times liquid DT density. Auerbach, J.M.; Mead, W.C.; Campbell, E.M.; Matthews, D.L.; Bailey, D.S.; Hatcher, C.W.; Koppel, L.N.; Lane, S.M.; Lee, P.H.Y.; Manes, K.R.; McClellan, G.; Phillion, D.W.; Price, R.H.; Rupert, V.C.; Slivinsky, V.W.; Swift, C.D. (Lawrence Livermore Laboratory, University of California, Livermore, California 94550). *Phys. Rev. Lett.;* **44**: No. 25, 1672-1675(23 Jun 1980).

Polymer-coated glass microspheres filled with DT fuel and argon seed gas were irradiated on the SHIVA 1.06-μm laser using 4-kJ 200 ps (full width at half maximum), Gaussian pulses. Measured light absorption, x-ray spectrum, neutron yields, and x-ray continuum images compare favorably with detailed computer simulations. Pusher neutron activation and argon line imaging diagnostics were utilized to measure fuel density. Fuel densities of 1-3 g/cm^3 or 5-15 times liquid DT density were inferred.

33126 Divergent impulsive cross flow over packed columnar arrays. Glenn, L.A. (California Univ., Livermore (USA). Lawrence Livermore Lab.). *Nucl. Eng. Des.;* **56**: No. 2, 429-437(Feb 1980).

A quasi-one-dimensional method was devised for calculating transient, compressible, viscous flows through packed beds and over tube bundles. The method was applied to study the impulsive crossflow of a lithium plasma through an array of liquid jets, a problem that arises in the design of inertial confinement fusion reactors. The jet array was a close-packed annular arrangement with the plasma initially contained within the annular cavity so that the flow was cylindrically divergent. It was found that the crosswise momentum imparted to the jets by the plasma derived mainly from form or profile drag and that skin friction effects were negligible. Plasma drag was estimated to contribute about 20% of the total radial impulse resulting from the pellet microexplosion.

33127 Fuel pellets and optical systems for inertially confined fusion. Hendricks, C.D. (California Univ., Livermore (USA). Lawrence Livermore Lab.). *J. Nucl. Mater.;* **85**: No. 86, 79-86(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

Current laser-driven ICF targets are complex sets of concentric spherical shells made from a variety of materials including the fuel (e.g., deuterium-tritium), glass, beryllium, gold, polymeric materials, organo-metallics, and several additional organic and inorganic materials depending on the particular experiments to be done. While we don't yet know what the reactor targets will be exactly, there is little reason to believe they will be just simple, low quality glass shells containing DT gas or simple spheres of deuterated polyethylene or other fuel. Consequently, we consider many of the current targets, materials, and fabrication techniques to be applicable to the long range problems of ICF reactor target fabrication. Many of our current material problems and fabrication techniques are discussed and various quality factors are presented in an attempt to bring an awareness of the possible fusion reactor target materials problems to the scientific and technical community.

33128 Material implications of design and system studies for inertial confinement fusion systems. Maniscalco, J.A.; Berwald, D.H. (Exxon Research and Engineering Co., Linden, NJ (USA)); Meier, W.R. (California Univ., Livermore (USA). Lawrence Livermore Lab.). *J. Nucl. Mater.;* **85**: No. 86, 37-46(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

The major material requirements for inertial confinement fusion (ICF) reactors and an indication of the research and development required to meet them are presented. These requirements are defined and analyzed by first describing the environment created in the process of generating energy with ICF, and then analyzing the laser ICF reactor concepts which have been designed to cope with this hostile environment. In this paper we discuss several ICF materials related problems. However, because of the large role given liquid lithium in most conceptual designs we have placed particular emphasis on describing the problems associated with flowing and containing liquid lithium in the pulsed radiation environment of ICF reactors.

33129 Cryogenic laser fusion target material design considerations. Miller, J.R.; Fries, R.J.; Press, W.J. (Los Alamos Scientific Lab., NM (USA)). *J. Nucl. Mater.;* **85**: No. 86, 121-125(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

Laser fusion target designs exhibit improved performance when the fusion fuel, a deuterium-tritium (DT) mixture, is frozen into a uniform, solid shell. The formation of such a shell requires rapid isothermal cooling of the target to cryogenic temperatures. The cooling rate must be sufficiently fast to prevent significant, gravitationally driven downward flow of the DT as it passes from the gaseous through the liquid state. Because it is not possible to measure the uniformity of a solid DT layer in opaque, multishell targets, we have modeled such targets to calculate the cooling rate and, hence, the expected thickness uniformity of the DT shell. The presented results provide target designers with practical guidelines for the selection of materials and configurations, which will assist in the fabrication of high-quality cryogenic targets.

COMPONENT DEVELOPMENT AND MATERIALS TESTING

REFER ALSO TO CITATION(S) 32579, 32586, 32603, 32614, 33104, 33109, 33128

33130 (ANL/FPP—79-3) **Fusion Power Program biannual progress report, April-September 1979.** (Argonne National Lab., IL (USA)). Feb 1980. Contract W-31-109-ENG-38. 121p. NTIS, PC A06/MF A01.

This biannual report summarizes the Argonne National Laboratory work performed for the Office of Fusion Energy during the April-September 1979 quarter in the following research and development areas: materials; energy storage and transfer; tritium containment, recovery and control; advanced reactor design; atomic data; reactor safety; fusion-fission hybrid systems; alternate applications of

fusion energy; and other work related to fusion power. Separate abstracts were prepared for three sections. (MOW)

33131 (ANL/FPP—79-3, pp 1-44) **Fusion reactor materials.** Sethi, V.K.; Scholz, R.; Nolfi, F.V. Jr.; Turner, A.P.L. Feb 1980.

In Fusion Power Program biannual progress report, April-September 1979.

Data are given for each of the following areas: (1) effects of irradiation on fusion reactor materials, (2) hydrogen permeation and materials behavior in alloys, (3) carbon coatings for fusion applications, (4) surface damage of TiB_2 coatings under energetic D^+ and $^4He^+$ irradiations, and (5) neutron dosimetry. (MOW)

33132 (HEDL-SA—2146) **Nuclear data relevant to shield design of FMIT facility.** Carter, L.L.; Morford, R.J.; Wilcox, A.D. (Hanford Engineering Development Lab., Richland, WA (USA)). 1980. Contract AC14-76FF02170. 36p. NTIS, PC A03/MF A01.

Nuclear data requirements are reviewed for the design of the Fusion Materials Irradiation Test (FMIT) facility. This accelerator-based facility, now in the early stages of construction at Hanford, will provide high fluences in a fusion-like radiation environment for the testing of materials. The nuclear data base required encompasses the entire range of neutron energies from thermal to 50 MeV. In this review, we consider neutron source terms, cross sections for thermal and bulk shield design, and neutron activation for the facility.

33133 (ORNL/TM—7360) **Calculation of neutron and gamma ray energy spectra for fusion reactor shield design: comparison with experiment.** Santoro, R.T.; Alsmiller, R.G. Jr.; Barnes, J.M.; Chapman, G.T. (Oak Ridge National Lab., TN (USA)). Aug 1980. Contract W-7405-ENG-26. 42p. NTIS, PC A03/MF A01.

Integral experiments that measure the transport of ~ 14 MeV D-T neutrons through laminated slabs of proposed fusion reactor shield materials have been carried out. Measured and calculated neutron and gamma ray energy spectra are compared as a function of the thickness and composition of stainless steel type 304, borated polyethylene, and Hevimet (a tungsten alloy), and as a function of detector position behind these materials. The measured data were obtained using a NE-213 liquid scintillator using pulse-shape discrimination methods to resolve neutron and gamma ray pulse height data and spectral unfolding methods to convert these data to energy spectra. The calculated data were obtained using two-dimensional discrete ordinates radiation transport methods in a complex calculational network that takes into account the energy-angle dependence of the D-T neutrons and the nonphysical anomalies of the S/sub n/ method.

33134 **Range calculations using multigroup transport methods.** Hoffman, T.J.; Robinson, M.T. (Oak Ridge National Lab., TN (USA)); Dodds, H.L. (Tennessee Univ., Knoxville (USA)). *J. Nucl. Mater.;* **85**: No. 86, 597-601(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

Several aspects of radiation damage effects in fusion reactor neutron and ion irradiation environments are amenable to treatment by transport theory methods. In this paper, multigroup transport techniques are developed for the calculation of particle range distributions. These techniques are illustrated by analysis of Au-196 atoms recoiling from (n,2n) reactions with gold. The results of these calculations agree very well with range calculations performed with the atomistic code MARLOWE. Although some detail of the atomistic model is lost in the multigroup transport calculations, the improved computational speed should prove useful in the solution of fusion material design problems.

33135 **Design with ceramics for fusion reactors.** Hopkins, G.R. (General Atomic Co., San Diego, CA (USA)). *J. Nucl. Mater.;* **85**: No. 86, 409-413(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

Ceramic materials used in the first wall and blanket regions of fusion reactors can provide very low radioactivity and high temperature systems with abundant raw material resources. Design problems arise in accommodating tensile stresses in structural members, however, with suitable designs, crack initiation, crack propagation and failures can be minimized. Several design concepts are discussed for inertial and magnetic confinement fusion reactors. A companion paper describes the analytical methods and results.

33136 **Performance of ceramic materials in high temperature steam and hydrogen.** Horn, F.L.; Fillo, J.A.; Powell, J.R. (Brookhaven National Lab., Upton, NY (USA)). *J. Nucl. Mater.;* **85**: No. 86, 439-443(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

Materials considered for use in fusion blankets for synthetic fuel production were exposed to flowing steam and a combination of steam and a combination of steam and hydrogen at temperatures up to 1668 K and flow velocities of 10 meters per second, which are characteristic of blanket design conditions. The penetration rate of 2 mm per year on silicon carbide in steam at 1400 K increased to 6 mm per year at 1600 K, while alumina, zirconia, and magnesia were below 0.1 mm per year. Steam containing 32 to 44 volume percent hydrogen caused a large increase in the erosion rate of alumina, zirconia, and magnesia at elevated temperatures. The temperature above which the erosion rate greatly increased was 1400 K for magnesia, 1550 K for alumina, and 1600 K for zirconia. The penetration rates below these temperatures were less than 0.1 mm per year; however, 100 K above these temperatures, the penetration rate increased four to six times and continued to increase with temperature. The erosion rate on silicon carbide was unaffected by the presence of hydrogen in the steam. Carbon dioxide was substituted for steam and hydrogen in several runs up to 1670 K, and no significant weight losses occurred. The silicon carbide acquired a porous-glassy coating at the highest temperature.

33137 **Effects of radiation on TFTR coil materials.** Imel, G.R.; Kelsey, P.V.; Ottewitte, E.H. (Idaho National Engineering Lab., Idaho Falls (USA)). *J. Nucl. Mater.;* **85**: No. 86, 367-371(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

The Coupled Fast Reactivity Measurements Facility (CFRMF) at the Idaho National Engineering Laboratory was used to irradiate coil insulation specimens provided by the Princeton Plasma Physics Laboratory. Exposure times were chosen as to be representative of expected lifetime doses in the TFTR. Shear bond and flexure tests were performed on irradiated samples; identical unirradiated samples were tested as controls. A general loss of strength (10-20%) was seen on the majority of specimens.

33138 **First wall protection schemes for inertial confinement fusion reactors.** Kulcinski, G.L. (Wisconsin Univ., Madison (USA)). *J. Nucl. Mater.;* **85**: No. 86, 87-97(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

The successful containment of thermonuclear yields ranging from 100-4000 MJ has presented a great challenge to the fusion reactor designer. It is shown that the thermal pulses associated with such pellet design can exceed the melting temperature in first walls unless either the chamber size is made unreasonably large (> 10 to 20 meters in diameter) or something is done to modify the energy spectra of the pellet debris. The various approaches to absorbing the photons and slowing down the charged particles and neutrons are reviewed. Fluidized walls and low pressure gases show great promise for protection of the cavity surfaces, but there are a number of critical experiments that need to be performed on both of these concepts before a final decision on their use in reactors can be made.

33139 **Relationship between material properties and the economics of fusion power.** Kummer, D.L. (McDonnell Douglas Astronautics Co., St. Louis, MO (USA)). *J. Nucl. Mater.;* **85**: No. 86, 47-56(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

Fusion power cost is influenced by materials, fabrication costs and a large number of material properties that impact reactor performance and safety. Reactor performance parameters that are affected include thermal to electrical conversion efficiency, neutron wall loading (power density), availability, and plasma burn time. Chief among the material properties affecting the above reactor performance parameters are the material's temperature limit and the mechanical, thermal and radiation damage properties that determine life and reliability. Extensive materials testing will be required to satisfy a reliability goal of not more than one wall failure per year. Material properties may affect safety issues such as tritium inventory, waste disposal and coolant choice. Determination of the impact of material properties on the cost of fusion power is addressed. This determination is incomplete in some cases.

33140 **ISX-A graphite limiter experiment.** Langley, R.A.; Colchin, R.J.; Isler, R.C.; Murakami, M.; Simpkins, J.E. (Oak Ridge National Lab., TN (USA)); Cecchi, J.L.; Corso, V.L.; Dylla, H.F.; Ellis, R.A. Jr. (Princeton Univ., NJ (USA). Plasma Physics Lab.); Nishi, M. (Hitachi Ltd., Ibaraki (Japan). Energy Research Lab.). *J. Nucl. Mater.;* **85**: No. 86, 215-219(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

ATJS graphite rail limiters were installed in the ISX tokamak in order to compare the resulting discharges to those obtained with the existing stainless steel limiters and to investigate operation of the graphite limiters at elevated temperatures using heating elements inside the graphite. No large systematic differences were observed in the electron temperature profiles, electron density profiles, nor Zsub(eff) between successive runs with the stainless steel (SS) limiters and graphite (G) limiters. There was, however, a monotonic decrease in Zsub(eff) for both cases from approx. 5.6 in the first run following the installation of the graphite limiters to approx. 2.8 after a two week period when the experiment was terminated due to a

scheduled shutdown. Normal incidence UV spectroscopic measurements of C, N, O, and H radiation showed a factor of 1.5-4 greater light for the SS case over the G case. Arc tracks were observed on the graphite limiters upon removal and SEM analysis was performed so that the amount of material removed could be estimated. As the graphite limiter was heated during a series of discharges, no increase was observed in either the plasma carbon contamination nor RGA hydrocarbon signals until the temperature rose above approx. 400°C.

33141 Displacement functions for diatomic materials. Parkin, D.M.; Coulter, C.A. (Los Alamos Scientific Lab., NM (USA)). *J. Nucl. Mater.;* **85**: No. 86, 611-615(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

We have used an extension of the methods of Lindhard et al. to calculate the total displacement function nsub(ij)(E) for a number of diatomic materials, where nsub(ij)(E) is defined to be the average number of atoms of type-j which are displaced from their sites in a displacement cascade initiated by a PKA of type-i and energy E. From the nsub(ij)(E) one can calculate the fraction etasub(ij)(E) of the type-j displacements produced by a type-i PKA with energy E. Values of the etasub(ij) for MgO, CaO, Al_2O_3, and TaO are presented. It is shown that for diatomic materials with mass ratios reasonably near one (e.g., MgO, Al_2O_3) and equal displacement thresholds for the two species the etasub(ij) become independent of the PKA type i at energies only a few times threshold. However, for larger mass ratios the etasub(ij) do not become independent of i until much larger energies are reached - e.g. $> 10^5$ eV for TaO. In addition, it is found that the etasub(ij) depend sensitively on the displacement thresholds, with very dramatic changes occuring when the two thresholds become significantly different from one another.

33142 Development of large rectangular ceramic insulators for ion accelerators for the neutral-beam program. Paterson, J.A.; Koehler, G.W.; Duffy, T.J. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). *J. Nucl. Mater.;* **85**: No. 86, 421-425(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

The need for structures that are resistant to damage for 14 MeV neutrons, are bakeable, and that can be closely packed together, has resulted in the intensive development of rectangular brazed ceramic insulators for ion accelerators. The development of two candidate materials, machinable glass ceramic and alumina, is described along with the ceramic-to-metal brazing techniques developed for each material. The microstructures of the brazed joints are examined and the results of microprobe studies presented. It has been found that the surfaces produced by different machining methods have a significant effect on the strength of brazed joints to the machinable glass ceramic. Lapped surfaces have given bond strengths up to three times those produced with other surfaces. Successful full-size brazes have been realized between alumina and titanium and between machinable glass and titanium. Vacuum tight joints between machinable glass and titanium have not been reliably achieved and more work is needed before brazing techniques to this promising new material are fully understood.

33143 Fusion materials irradiation test facility at Hanford. Pottmeyer, E.W. Jr. (Westinghouse Hanford Co., Richland, WA (USA). Hanford Engineering Development Lab.). *J. Nucl. Mater.;* **85**: No. 86, 463-465(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

The Fusion Materials Irradiation Test Facility (FMIT) is a high-energy, high-flux neutron source for fusion materials development. The FMIT linear accelerator will produce a 35 MeV beam of deuterons that generates high-energy neutrons by a nuclear stripping reaction with flowing liquid lithium targets. The targets will be located in two identical irradiation test cells, either of which will provide an irradiation volume of 10 cm^3 at a neutron flux of 10^{15} n/cm^2-s. FMIT has been authorized by the US Congress and will be constructed and operated by the Hanford Engineering Development Laboratory (HEDL) at Richland, Washington, in collaboration with the Los Alamos Scientific Laboratory (LASL) which is providing the accelerator design. The project is currently entering the detailed design phase, targeting for start of construction in early 1980 and operation in 1983-84. Research and development programs are underway at both HEDL and LASL to resolve uncertainties in the lithium target and accelerator designs.

33144 Radiation damage in diagnostic windows for the TFTR. Primak, W. (Argonne National Lab., IL (USA)). *J. Nucl. Mater.;* **85**: No. 86, 405-407(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

Radiation effects in diagnostic window materials are being estimated and additional experimental data on the radiation behavior is being sought. The materials considered thus far are vitreous silica, crystal quartz, and synthetic sapphire.

33145 Composite materials for tokamak wall armor, limiters, and beam dump applications. Riley, R.E.; Wallace, T.C.; Dickinson, J.M. (Los Alamos Scientific Lab., NM (USA)). *J. Nucl. Mater.;* **85**: No. 86, 221-224(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

A new generation of composite materials, graphite fiber reinforced metal carbides and borides, is being developed. These materials have high strengths and excellent chemical and mechanical stability. Their properties can be tailored over wide ranges to meet service requirements. By using components such as boron, silicon or titanium, these composites offer promise as low Z number materials for limiters, wall armor, beam stops, etc., in tokamaks.

33146 Application of martensitic stainless steels in long lifetime fusion first wall/blankets. Rosenwasser, S.N.; Miller, P.; Dalessandro, J.A.; Rawls, J.M.; Toffolo, W.E.; Chen, W. (General Atomic Co., San Diego, CA (USA)). *J. Nucl. Mater.;* **85**: No. 86, 177-182(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

An assessment is made of the feasibility and design impact of using a ferromagnetic martensitic steel such as HT-9 in first wall/blanket structures. A preliminary analysis indicates that HT-9 may offer significantly greater wall lifetimes than 20% cold worked type 316 stainless steel for temperatures below about 520°C. A number of exploratory measurements and rough calculations suggest that the presence of ferromagnetic material does not significantly affect the operational characteristics of tokamak power reactors.

33147 Spatial variations of damage parameters in FMIT and their implications. Schiffgens, J.O.; Simons, R.L.; Mann, F.M.; Carter, L.L. (Hanford Engineering Development Lab., Richland, WA (USA)). *J. Nucl. Mater.;* **85**: No. 86, 491-495(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

The major conclusion is that the variation in damage rates in FMIT will be dominated by changes in flux, not spectrum. Throughout the test region where the flux is greater than 10^{14} n/cm^2-s, the flux varies by a factor of about 20, while the spectral-averaged displacement and helium production cross sections for copper vary by less than factors of two and four, respectively. The corresponding helium-to-dpa ratios bracket a fusion reactor first wall value for copper (i.e., 7.7 appm He/dpa). With the Li(d,n) yields and with the copper damage energy and helium production cross sections used in this study, the test volumes for which the displacement and total helium production rates are greater than those at a D-T fusion reactor first wall (with a loading of 1.0 MW/m^2) are about 139 and 208 cm^3, respectively.

33148 Materials implications of fusion-fission reactor designs. Schultz, K.R. (General Atomic Co., San Diego, CA (USA)). *J. Nucl. Mater.;* **85**: No. 86, 29-36(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

In this paper the fusion-fission reactor concept is briefly reviewed. The potential operating modes for fusion-fission systems are reviewed with emphasis on their materials environments, and the materials implications of the assumed mainline fuel producing hybrid are discussed from the reactor designer's point of view. The impact of materials performance on hybrid reactor design is assessed and it is suggested that although materials performance is of vital concern and further materials evaluation work is needed, the materials requirements of the hybrid are an overlap of fusion and fission requirements and appear to be less demanding than those of fission and fusion systems alone.

33149 Application of dynamical computer models to high energy cascades. Heinisch, H.L.; Schiffgens, J.O. (Hanford Engineering Development Lab., Richland, WA (USA)); Schwartz, D.M. (California State Univ., Northridge (USA)). *J. Nucl. Mater.;* **85**: No. 86, 607-610(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

A modification of the quasi-dynamical computer code ADDES has been developed to allow for the simulation of defect production in high energy cascades. In the first of a two-stage modeling process, the cascade is allowed to develop until no atom has more than a relatively high cut-off energy. As atoms fall below the cut-off, they are tagged and removed from consideration during the remainder of the development. The second stage is the evaluation of defect production by energetic atoms tagged in the first stage using a defect yield function determined from dynamical simulation of low energy events. This code is used to simulate defect production in 10 keV cascades in several directions in copper, and the results are compared with those of the binary collision code MARLOWE. Good agreement is obtained when an effective recombination radius of 2.2 lattice parameters is assumed.

33150 Swelling with inhomogeneous point defect production - a cascade diffusion theory. Mansur, L.K.; Coghlan, W.A. (Oak Ridge National Lab., TN (USA)); Brailsford, A.D. (Ford Motor Co., Dearborn, MI (USA)). *J. Nucl. Mater.;* 85: No. 86, 591-595(Dec 1979).

From 1. topical meeting on fusion reactor materials; Miami Beach, FL (29 - 31 Jan 1979).

A theoretical model is described to evaluate the effects of spatially and temporally discrete production of point defects in collision cascades. Large fluctuations occur with time in the vacancy concentration. The interstitial concentration is nearly always zero except for extremely large spikes of short duration, corresponding to the occurrence of a cascade anywhere within the sphere beyond which all generated defects are absorbed by sinks before reaching the reference point. The growth rate of a void in this environment is compared to that given by the more approximate rate theory. The difference is small, but increases at high temperature. This work has implications for void nucleation, irradiation creep, and analysis of pulsed irradiations.

GENERAL AND MISCELLANEOUS

MANAGEMENT

REFER ALSO TO CITATION(S) 31585

33151 (CEP—80/1) Current energy patents. Abstracts 1 to 423. Stuber, C.E. (ed.). (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Jan 1980. 102p. TIC.

This new publication provides abstracting and indexing coverage of the international patent literature, including patent applications, concerning any aspect of energy production, conservation, and utilization. The literature is arranged by subject category, and, within category, by the country issuing the patent. Assignee, inventor, subject, and patent number indexes are provided. (RWR)

33152 (ORNL/TM—6428) ORNL Direct Purchase Information System (DPIS) user's manual. Grubb, J.W.; Lovin, J.K.; Smith, M.B.; Haese, R.L.; Needham, D.B.; Wilson, J.K. (Oak Ridge National Lab., TN (USA)). Aug 1980. Contract W-7405-ENG-26. 106p. NTIS, PC A06/MF A01.

The ORNL Management Information System (MIS) Direct Purchase Information System (DPIS) is an on-line interactive system of computer programs. The system can provide a manager with commitment and delivery schedule information on current direct purchase requisitions. The commitment data accounts for the orders that have been placed and those requisitions yet to be placed with a vendor. Information can be summarized at many different levels, and individuals can quickly determine the status of their requisitions. DPIS contains data only on active outside direct purchases, but has the capability to access historical data. It provides sufficient flexibility to be used to answer many questions pertinent to the status of these direct purchases and their obligating costs. Even an inexperienced computer user should have little difficulty in learning to use DPIS. The User Module prompts the user on what type of response it is expecting. If the user has doubts as to the response, or if the meaning of the response is not clear, the module will give a detailed list of the options available at that level. The user has control of what data are to be considered, how they are to be grouped, and what format the output will take. As the user selects the options available at a given level, the module proceeds to the next lower level until sufficient input has been supplied to provide the requested information. A major benefit of this interactive, user-oriented system is that the manager can specify the information requirements and does not have to spend time going through a great deal of other data to locate what is needed. Because it is interactive, a search can begin at a summary level and then resort to a more detailed level if needed. DPIS allows the user direct control for selecting the type of commitment data, output, funds, and direct purchase.

MATHEMATICS AND COMPUTERS

REFER ALSO TO CITATION(S) 32775, 33065

33153 (ANL—80-42) Applied Mathematical Sciences research at Argonne, October 1, 1978-March 31, 1980. Pieper, G.W. (ed.). (Argonne National Lab., IL (USA)). 1980. Contract W-31-109-ENG-38. 39p. NTIS, PC A03/MF A01.

This report reviews the research activities of the Applied Mathematical Sciences Section for the period October 1, 1978, through March 31, 1980. The body of the report discusses various projects carried out in four major areas of research: applied analysis, computational mathematics, software engineering, and software clinics. Information on section staff, visitors, workshops, and seminars is found in the appendices. Descriptions of individual research topics are very brief.

33154 (ANL—80-68) Implementation guide for MINPACK-1. Garbow, B.S.; Hillstrom, K.E.; More, J.J. (Argonne National Lab., IL (USA)). Jul 1980. Contract W-31-109-ENG-38. 45p. NTIS, PC A03/MF A01.

MINPACK-1 is a package of Fortran subprograms for the numerical solution of systems of nonlinear equations and nonlinear least-squares problems. This report describes how to implement the package from the tape on which it is transmitted. 3 tables.

33155 (BNL—28138) Numerical method for solving elliptic boundary value problems in unbounded domains. Goldstein, C.I. (Brookhaven National Lab., Upton, NY (USA)). Jul 1980. Contract AC02-76CH00016. 8p. (CONF-800699—1). NTIS, PC A02/MF A01.

From Elliptic problem solvers conference; Santa Fe, NM, USA (30 Jun 1980).

A numerical method for solving elliptic boundary value problems in unbounded domains is described. An artificial boundary near infinity, say a sphere Γ/sub R/ of large radius R, and an approximate local boundary condition on Γ/sub R/ are introduced. A finite element method is then employed to discretize this approximate problem. Since R must be large in order to estimate the error due to the artificial boundary, the resulting system of linear equations is usually quite large. A description is given on how to reduce the number of linear equations to the asymptotically optimal amount, while optimal error estimates and the sparseness of the matrix are preserved, by grading the mesh systematically in such a way that the element mesh sizes are increased as the distance from the origin increases. Some numerical results are given. 1 table. (RWR)

33156 (CONF-800733—1) Lanczos algorithm for symmetric eigenvalue problems. Scott, D.S. (Union Carbide Corp., Oak Ridge, TN (USA). Nuclear Div.). 1980. Contract W-7405-ENG-26. 25p. NTIS, PC A02/MF A01.

From Conference on sparse matrices and their uses; Reading, UK (9 Jul 1980).

The Lanczos algorithm was originally used to tridiagonalize symmetric matrices, but it was soon replaced by more effective methods based on explicit orthogonal similarity transformations. The algorithm was later revived as an effective scheme for solving sparse symmetric eigenvalue problems. The historical development and the current state of the Lanczos algorithm are surveyed.

33157 (COO—3077-160) Similarity solutions of systems of partial differential equations using MACSYMA. Rosenau, P.; Schwarzmeier, J.L. (New York Univ., NY (USA). Courant Inst. of Mathematical Sciences). Oct 1979. Contract AC02-76ER03077. 24p. NTIS, PC A02/MF A01.

A code has been written to use the algebraic computer system MACSYMA to generate systematically the infinitesimal similarity groups corresponding to systems of quasi-linear partial differential equations. The infinitesimal similarity groups can be used to find exact solutions of the partial differential equations. In an example from fluid mechanics the similarity method using the computer code reproduces immediately a solution obtained from dimensional analysis.

33158 (DOE/TIC—11216) Computerized technical-document preparation (TXT users manual). De Volpi, A.; Fenrick, M.R.; Stanford, G.S.; Fink, C.L.; Rhodes, E.A. (Argonne National Lab., IL (USA)). Mar 1980. Contract W-31-109-ENG-38. 74p. NTIS, PC A04/MF A01.

The computer-assisted text-processing system, called TXT, has been implemented to benefit primarily the originator of technical reports. The system is of particular value to professional staff, such as scientists and engineers, who have responsibility for generating much correspondence or lengthy, complex reports or manuscripts - especially if prompt turnaround and high accuracy are required. It can produce text that contains special Greek or math symbols. Written in FORTRAN and MACRO, the program TXT operates on a PDP-11 minicomputer under the RSX-11M multi-task multi-user monitor. Periphera hardware includes videoterminals, electrostatic printers, and magnetic disks. Either data- or word-processing tasks may be performed at the terminals.

33159 (LA—8435-MS) MBD diagnostics. Dawson, W.K. (Los Alamos Scientific Lab., NM (USA)). Jul 1980. Contract W-7405-ENG-36. 84p. NTIS, PC A05/MF A01.

A series of tests for the BiRa Microprogrammed Branch Driver has been written and assembled into a coherent system. Detailed and understandable error diagnostics are given by each test. Experience to date indicates that an MBD that passes all tests in the system will operate reliably. An appendix gives details of engineer-

ing change orders devised to cure problems revealed by the tests. 6 figures

33160 (LA—8470-MS) **Department of Energy research in utilization of high-performance computers.** Buzbee, B.L.; Worlton, W.J.; Michael, G.; Rodrigue, G. (Los Alamos Scientific Lab., NM (USA)). Aug 1980. Contract W-7405-ENG-36. 14p. NTIS, PC A02/MF A01.

Department of Energy (DOE) and other Government research laboratories depend on high-performance computer systems to accomplish their programmatic goals. As the most powerful computer systems become available, they are acquired by these laboratories so that advances can be made in their disciplines. These advances are often the result of added sophistication to numerical models, the execution of which is made possible by high-performance computer systems. However, high-performance computer systems have become increasingly complex, and consequently it has become increasingly difficult to realize their potential performance. The result is a need for research on issues related to the utilization of these systems. This report gives a brief description of high-performance computers, and then addresses the use of and future needs for high-performance computers within DOE, the growing complexity of applications within DOE, and areas of high-performance computer systems warranting research. 1 figure.

33161 (LA-UR—80-2127) **Multi-grid and ICCG for problems with interfaces.** Dendy, J.E.; Hyman, J.M. (Los Alamos Scientific Lab., NM (USA)). 1980. Contract W-7405-ENG-36. 6p. (CONF-800756—1). NTIS, PC A02/MF A01.

From Elliptic equation conference; Santa Fe, NM, USA (Jul 1980).

Computation times for the multi-grid (MG) algorithm, the incomplete Cholesky conjugate gradient (ICCG) algorithm [J. Comp. Phys. 26, 43-65 (1978); Math. Comp. 31, 148-162 (1977)], and the modified ICCG (MICCG) algorithm [BIT 18, 142-156 (1978)] to solve elliptic partial differential equations are compared. The MICCG and ICCG algorithms are more robust than the MG for general positive definite systems. A major advantage of the MG algorithm is that the structure of the problem can be exploited to reduce the solution time significantly. Five example problems are discussed. For problems with little structure and for one-shot calculations ICCG is recommended over MG, and MICCG, over ICCG. For problems that are done many times, it is worth investing the effort to study methods like MG. 1 table (RWR)

33162 (ORNL/CSD—63) **Solution of large-scale sparse least squares problems using auxiliary storage.** George, A.; Heath, M.T.; Plemmons, R.J. (Oak Ridge National Lab., TN (USA)). Aug 1980. Contract W-7405-ENG-26. 41p. NTIS, PC A03/MF A01.

Very large sparse linear least-squares problems arise in a variety of applications, such as geodetic network adjustments, photogrammetry, earthquake studies, and certain types of finite element analysis. Many of these problems are so large that it is impossible to solve them without using auxiliary storage devices. Some problems are so massive that the storage needed for their solution exceeds the virtual address space of the largest machines. A method for solving such problems on a typical (large) computer is described, and the results of some experiments illustrating the effectiveness of this approach are provided. The method includes an automatic partitioning scheme that is essential to the efficient management of the data on auxiliary files. 8 figures, 2 tables

33163 (SAND—80-0417C) **Solving ODEs in quasi steady state.** Shampine, L.F. (Sandia National Labs., Albuquerque, NM (USA)). 1980. Contract AC04-76DP00789. 12p. (CONF-800497—1). NTIS, PC A02/MF A01.

From Workshop on numerical integration of ordinary differential equations; Bielefeld, F.R. Germany (14 Apr 1980).

Solving ordinary differential equations (ODEs) with solutions in a quasi steady state has been studied by computational chemists, applied mathematicians, and numerical analysts. This paper first discusses what stiffness is for model problems arising in chemical kinetics. Chemists and applied mathematicians have made use of quasi-steady-state approximations (singular perturbation theory) to alter the problem so as to avoid stiffness. The approach is described and some difficulties are noted. Numerical analysts have developed methods to solve general stiff ODEs. How they relate to the problem at hand is described and some difficulties are pointed out. Finally, ideas from both approaches are combined. The new combination deals effectively with stiffness when the quasi steady state hypothesis is valid.

33164 (UCID—18757) **Contour plotting programs for printer and Calcomp plotter.** Moller, P. (California Univ., Livermore (USA). Lawrence Livermore Lab.). Jul 1980. Contract W-7405-ENG-48. 16p. NTIS, PC A02/MF A01.

Contour plotting programs for plotting contour diagrams on printers or Calcomp plotters are described. The subroutines also exist in versions that are useful for the special application of finding minima and saddlepoints of nuclear potential energy surfaces generated by the subroutine PETR3 of another program package. For the general user, however, the most interesting aspect of the plotting package is probably the possibility of generating printer contour plots. The plotting of printer contour plots is a very fast and convenient way of displaying two-dimensional functions. 3 figures.

33165 (UCRL—84658) **Signal processing aspects of the S-1 multiprocessor project.** Farmwald, P.M.; Bryson, W.; Manferdelli, J.L. (California Univ., Livermore (USA). Lawrence Livermore National Lab.). 28 Jul 1980. Contract W-7405-ENG-48. 9p. (CONF-800719—7). NTIS, PC A02/MF A01.

From International symposium of the Society of Photo-Optical Instrumentation Engineers; San Diego, CA, USA (28 Jul 1980).

The S-1 family of uni- and multiprocessors is an extremely-high-performance but relatively inexpensive general-purpose set of digital processing systems being developed for the most demanding National security applications. A typical S-1 system consists of from one to sixteen S-1 uniprocessors sharing up to 4 gigawords of uniformly addressed main memory. Each uniprocessor of the current (Mark IIA) generation has computational power roughy equivalent to that of a CRAY-1. This paper gives a general description of the S-1 Mark IIA uniprocessor and a somewhat more extensive discussion of its signal processing hardware and hardware-executed algorithms. The focus is a discussion of the felicitous properties of the uniprocessor components that make the S-1 system a powerful general-purpose digital signal processor. 3 figures, 3 tables.

33166 **Comparison the three methods for selecting values of input variable in the analysis of output from a computer code.** McKay, M.D. (Los Alamos Scientific Lab., NM); Beckman, R.J.; Conover, W.J. *Technometrics;* **21**: No. 2, 239-245(May 1979).

Two types of sampling plans are examined as alternatives to simple random sampling in Monte Carlo studies. These plans are shown to be improvements over simple random sampling with respect to variance for a class of estimators that includes the sample mean and the empirical distribution function. 6 figures.

33167 **Some new sequences generalizing the Catalan and Motzkin numbers.** Stein, P.R.; Waterman, M.S. (Univ. of California, Los Alamos, NM). *Discrete Math.;* **26**: 261-272(1978).

Some new sequences are introduced that satisfy quadratic recurrence rules similar to those satisfied by the classical Catalan numbers and the less well-known Motzkin numbers. For each sequence the general term is expressed as a sum of products of Catalan numbers and generalized Fibonacci numbers. In addition, first-order asymptotic formulas are given for the most interesting cases. 3 tables.

INFORMATION HANDLING

REFER ALSO TO CITATION(S) 31619, 31671, 31704, 32363, 32364, 32760

33168 (DOE/TIC—4585-R1(Suppl.5)) **Energy Information Data Base: corporate author entries.** (Department of Energy, Oak Ridge, TN (USA). Technical Information Center). Mar 1980. 92p. NTIS, PC A05/MF A01.

One of the controls for information entered into the data bases created and maintained by the DOE Technical Information Center is the standardized name for the corporate entity or the corporate author. The purpose of Energy Information Data Base: Corporate Author Entries (TID-4585-R1) and this supplemental list of authorized or standardized corporate entries is to provide a means for the consistent citing of the names of organizations in bibliographic records. In general, an entry in Corporate Author Entries consists of the seven-digit code number assigned to the particular corporate entity, the two-letter country code, the largest element of the corporate name, the location of the corporate entity, and the smallest element of the corporate name (if provided). This supplement [DOE/TIC-4585-R1(Suppl.5)] contains additions to the base document (TID-4585-R1) and is intended to be used with that publication. (RWR)

33169 (GEPP-TIS—519) **Application of word processing to engineering documentation.** McGirr, C.J. (General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.). 25 Aug 1980. Contract AC04-76DP00656. 13p. NTIS, PC A02/MF A01.

Word processing has increased the production rate of engineering documents at the General Electric Neutron Devices Department. Time reductions are 10 percent for original typing, 35 percent for document revisions, and 90 percent for repetitive typing. Total man-hours saved annually are 1155. The system consists of two work stations, a master central processing unit, and a daisy printer. These are ties into a large-scale computer. 4 figures.

CIVILIAN DEFENSE

33170 (AD-A—076026) **Survivability in a nuclear weapon environment. Final report 30 Sep 77-30 Apr 79.** Longinow, A. (IIT Research Inst., Chicago, IL (USA)). May 1979. Contract DCPA01-77-C-0229. 161p. NTIS, PC A08/MF A01.

This report contains information on protective capabilities of a variety of different personnel shelters against prompt effects of nuclear weapons. This information was collected from previous studies performed for DCPA in this subject area. Protective capabilities are expressed in terms of 'people survivability functions' which relate the probability of survival (or percent survivors) to the free field overpressure at the shelter site. Respective shelters are described in terms of their geometry and material properties. The following shelter categories are included. (1) Existing Engineered Buildings (Upper Stories and Basements), (2) Designed Basements, (3) Single-Purpose Shelters, (4) Dual-Purpose Shelters, (5) Expedient and Special Purpose Shelters and (6) Expediently Upgraded Shelters.

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Each entry under a corporate heading gives the report title and the volume and abstract numbers. Report numbers, if applicable, are given in parentheses at the end of the entry.

DOE Energy Information Data Base: Corporate Author Entries (TID-4585) is used in the standardization of corporate entries. TID-4585 is available for purchase from the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, Virginia 22161.

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Natural gas: its contribution to energy conservation, 5:32455 (NP—25002)
Bureau of Mines, Albany, OR (USA). Albany Research Center
Solvent extraction of cobalt from laterite-ammoniacal leach liquors, 5:32494 (BM-RI—8419)
Bureau of Mines, Avondale, MD (USA). Avondale Research Center
Laboratory corrosion studies in low- and high-salinity geobrines of the Imperial Valley, California, 5:32123 (BM-RI—8415)
Bureau of Mines, Salt Lake City, UT (USA). Salt Lake City Research Center
Analytical chemistry of the citrate process for flue gas desulfurization, 5:31524 (BM-IC—8819)
Bureau of Mines, Tuscaloosa, AL (USA)
Environmental evaluation of polyethylene oxide when used as a flocculant for clay wastes, 5:32762 (BM-RI—8438)
Burns and Roe, Inc., Woodbury, NY (USA)
Preliminary assessment of alternative PFBC power plant systems. Final report, 5:32190 (EPRI-CS—1451)
Butler Mfg. Co., Grandview, MO (USA). Research Center
Heating/daylighting prototype development. Phase I, Passive and Hybrid Solar Manufactured Building Project. Interim report and project status report No. 1, 1 October 1979-29 February 1980, 5:31987 (DOE/CS/30367—1)

C

California Energy Commission, Sacramento (USA)
Agricultural waste water as a potential source of cooling water for California electric power plants, 5:32189 (P—300-80-022)
Assessment of electric-utility supply plans, 1978-2000, 5:32407 (P—102-79-015)
Assessment of electric-utility supply plans, 1978-2000, 5:32408 (P—102-80-005)
California Energy Commission Conservation Division Regulations for Appliance Efficiency Standards (includng requirements for intermittent ignition devices): relating to refrigerators and freezers, room air conditioners, central air conditioners, gas space heaters, water heaters, plumbing fittings, gas clothes dryers, and gas cooking appliances, 5:32441 (P—400-80-001)
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California plan for the residential conservation service, 5:32457 (P—400-80-062)
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Exploring new choices for California: the 1980/81 Report to the Legislature, 5:32416 (P—500-80-008)
Exploring new energy choices for California: the 1979/80 R and D report to the Legislature. Volume II. Project descriptions, 5:32382 (P—102-79-003)
Feasibility of cogeneration energy supply for Oakland Airport terminal facilities: Consultant report. Final report, 5:32465 (P—500-80-029)
Feasibility study of a waste-fueled, fluidized bed cogeneration facility: consultant report, 5:32493 (P—500-80-027)
Geothermal Advisory Committee to California State Enery Resources Development and Conservation Commission. Final report, 5:32417 (P—800-79-004)
Independent staff energy-demand forecast for consideration in the proceedings on the Third Biennial Report, 5:32394 (P—102-80-010)
Methanol/ethanol/gasoline blend-fuels demonstration with stratified-charge-engine vehicles: Consultant report. Final report, 5:32512 (P—500-80-14)
Model warranty for solar energy contractors, 5:32049 (P—140-80-002)
Potential of energy farming in the southeastern California desert, 5:31844 (P—500-80-017)
Refrigerator and freezer directory: sort by type. Based on 1977 standards, 5:32456 (P—400-00-017)
Regulations for the California Solar Energy Tax Credit, 5:31787 (P—500-78-039)
Residential space heating: solar and electric resistance systems cost and performance data, 5:32004 (P—104-80-001)
Sacramento area, solar domestic water heater installers survey report, 5:32039 (P—104-79-005)
Summary of major electric utilities revised demand forecasts and resource plans, 5:32409 (P—300-79-005)
Synopsis of the energy-demand forecasting/peer-review workshop, 5:32410 (P—300-80-023)
Testimony on Bonneville Power Administration rates and policy: November 1978, May and August 1979, 5:32411 (P—500-80-007)
Uranium resources: a review of estimation methodologies. Consultant report, 5:31630 (P—300-80-025)
Warren-Alquist State Energy Resources Conservation and Development Act, Public Resources Code Section 25000 et seq, 5:32399 (P—160-79-002)
California Inst. of Tech., Pasadena (USA)
Reactivity patterns of transition metal hydrides and alkyls, 5:32658 (LBL—10214)
California State Univ., Humboldt, Arcata (USA). Dept. of Chemistry
Simulation model for the performance analysis of roof pond systems for heating and cooling, 5:32001 (LBL—9292(Rev.))
California State Univ., Sacramento (USA). Dept. of Mechanical Engineering
Comparative study of solar domestic hot water systems in California. Consultant report, 5:32040 (P—500-79-015)
California Univ., Berkeley (USA)
Geological interpretation of self-potential data from the Cerro Prieto geothermal field, 5:32094 (LBL—9544)
Seismic isolation of an electron microscope, 5:32747 (LBL—10386)
California Univ., Berkeley (USA). Dept. of Chemical Engineering
Processing needs and methodology for wastewaters from the conversion of coal, oil shale, and biomass to synfuels, 5:31527 (DOE/EV—0081)
California Univ., Berkeley (USA). Dept. of Mechanical Engineering
Structure of a poly(ethylene) opposed flow diffusion flame, 5:32680 (LBL—10784)
California Univ., Berkeley (USA). Lawrence Berkeley Lab.
Air flow into the LBL Bevatron, 5:32723 (LBL—10972)
Buoyancy-driven convection in a rectangular enclosure: experimental results and numerical calculations, 5:32003 (LBL—10257)
Condensation film coefficients for mixtures of isobutane and isopentane, 5:32117 (LBL—11025)
DOE-2 reference manual, 5:32443 (LA—7689-M(Ver.2.1)(Pt.2))
DOE-2 reference manual, 5:32444 (LA—7689-M(Ver.2.1)(Pt.1))
DOE-2 users guide: version 2.1, 5:32438 (LBL—8689(Rev.1))
Energy conservation and energy decentralization: issues and prospects, 5:32389 (LBL—11219)
Energy storage in aquifers: a survey of recent theoretical studies, 5:32338 (LBL—11059)
Erosion-corrosion-wear program, 5:32560 (LBL—11109)
Experimental and theoretical studies of thermal energy storage in aquifers, 5:32337 (LBL—10889)
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Field air leakage of newly installed residential windows, 5:32454 (LBL—9937)
Geophysical applications of squids, 5:32888 (LBL—11115)
Importance of the specific heat anomaly in the design of binary Rankine cycle power plants, 5:32114 (LBL—10974)
In situ observations of gas/solid reactions, 5:32650 (LBL—10729)
Influence of surface silica impurities on the sintering behavior of alumina powders, 5:32589 (LBL—10392)

Intersecting faults and sandstone stratigraphy at the Cerro Prieto geothermal field, 5:32086 (LBL—9546)
Kinetics of silica polymerization, 5:32124 (LBL—7033)
Legal and institutional aspects of regulating intermedia pollution, 5:32371 (LBL—11177)
New measurement strategy for in situ testing of wall thermal performance, 5:32439 (LBL—8822)
Nuclear materials research progress reports for 1979, 5:32578 (LBL—11030)
Nuclear structure at high angular momentum, 5:33042 (LBL—10957)
Numerical modeling studies of the Cerro Prieto reservoir, 5:32087 (LBL—9590)
Ocean Thermal Energy Conversion preliminary data report for the February 1978 GOTEC-03 cruise to the Gulf of Mexico, mobile site, 5:31874 (LBL—9438)
Probabilistic simulation of subsurface fluid flow: a study using a numerical scheme, 5:32886 (LBL—10711)
Residential ventilation with heat recovery: improving indoor air quality and saving energy, 5:32440 (LBL—9749)
Simulation model for the performance analysis of roof pond systems for heating and cooling, 5:32001 (LBL—9292(Rev.))
Sloshing of liquids in rigid annular cylindrical and torus tanks due to seismic ground motions, 5:32216 (LBL—10351)
Structure of a poly(ethylene) opposed flow diffusion flame, 5:32680 (LBL—10784)
Study of rock-water-nuclear waste interactions in the Pasco Basin, Washington. Part I. Distribution and composition of secondary and primary mineral phases in basalts of the Pasco Basin, Washington, 5:31694 (LBL—9677)
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Synthetic chloroplasts, 5:31858 (LBL—11168)
Thermosiphon water heaters with heat exchangers, 5:32002 (LBL—10033)
Transposed critical temperature Rankine thermodynamic cycle, 5:32116 (LBL—10312)

California Univ., Davis (USA). Dept. of Applied Science
Adiabatic Hamiltonian deformation, linear response theory, and nonequilibrium molecular dynamics, 5:32911 (UCRL—84455)

California Univ., Davis (USA). Dept. of Mechanical Engineering
Comparative study of solar domestic hot water systems in California. Consultant report, 5:32040 (P—500-79-015)

California Univ., Livermore (USA). Lawrence Livermore Lab.
Accuracy of various alternate methods of calculating total mass flow rate for PKL instrumented pipe spool prototype tests in single- and two-phase steam-water flows, 5:32305 (UCRL—52965)
Application of the Reissner principle to the postbuckling of plates exposed to creep, 5:32683 (UCRL—82233)
California energy flow in 1978, 5:32415 (UCID—18760)
Contour plotting programs for printer and Calcomp plotter, 5:33164 (UCID—18757)
Currents and voltages in the MFTF coils during the formation of a normal zone, 5:33107 (UCID—18490)
Earthquake engineering programs at the Lawrence Livermore Laboratory, 5:32285 (UCRL—82234(Rev.1))
E-Divisionn activities report, 5:32949 (UCID—17271-80)
Effectiveness of self-contained breathing apparatus in a fire environment, 5:32686 (UCRL—84036)
Energy storage systems for automobile propulsion: 1979 study. Volume 1. Overview and findings, 5:32513 (UCRL—52841(Vol.1))
Extreme ultraviolet diagnosis of a neutral-beam-heated mirror machine, 5:33079 (UCRL—52751)
General chemistry division quarterly report, January-March 1980, 5:32634 (UCID—15644-80-1)
Hazard index for underground toxic material, 5:32780 (UCRL—52889)
Mechanical energy storage technology project. Annual report for calendar year 1979, 5:32336 (UCRL—50056-79)
MXLKID: a maximum likelihood parameter identifier, 5:33065 (UCID—18744)
Program TOMSCAT, 5:33075 (UCID—18636)
Reservoir response to tidal and barometric effects, 5:32145 (UCRL—84461)
Shale oil cracking. 2. Effect on oil composition, 5:31616 (UCID—18763)
Statistical methods for including two-body forces in large system calculations, 5:33043 (UCID—18740)
Stressmeter placement at spent fuel test in climax granite, 5:31669 (UCID—18629)
Study of calculated and measured time dependent delayed neutron yields, 5:33038 (UCRL—52945)
TDC: a computer code for calculating chemically reacting hydrodynamic flows in two dimensions, 5:32681 (UCRL—52931)
Three-dimensional linear analysis of fluid-structure interaction effects in the Mark I BWR pressure suppression torus, 5:32217 (UCRL—82217)
User's manual for DYNA2D: an explicit two-dimensional hydrodynamic finite element code with interactive rezoning, 5:33066 (UCID—18756)

California Univ., Livermore (USA). Lawrence Livermore National Lab.
Adiabatic Hamiltonian deformation, linear response theory, and nonequilibrium molecular dynamics, 5:32911 (UCRL—84455)
ASCOT data base management system, 5:32760 (UCID—18752)
DASLL: an automatic printed circuit board layout system, 5:32705 (UCRL—84640)
Liquid-metal embrittlement of refractory metals by molten plutonium, 5:32552 (UCRL—83986)
Metal Organic-Chemical Vapor Deposition fabrication of semiconductor lasers, 5:32693 (UCRL—84763)
Physical model of lean suppression pressure oscillation phenomena: steam condensation in the light water reactor pressure suppression system (PSS), 5:32329 (UCRL—84151)
Potential methods for methane extraction from geopressured brine at high temperature and pressure, 5:31597 (UCRL—84064)
Review of the 1979 workshop on thermomechanical modeling for a hard rock waste repository, 5:31706 (UCRL—84643)
Signal processing aspects of the S-1 multiprocessor project, 5:33165 (UCRL—84658)
Statement by Douglas R. Stephens, Project Leader, in situ coal gasification, Lawrence Livermore National Laboratory to the Subcommittee on Energy Research and Development Senate Committee on Energy and National Resources, 5:31477 (UCID—18748)

California Univ., Los Angeles (USA). Dept. of Chemical, Nuclear, and Thermal Engineering
Use of risk aversion in risk acceptance criteria, 5:32309 (ALO—83)

California Univ., Los Angeles (USA). Lab. of Nuclear Medicine and Radiation Biology
Emission computed tomography of ^{18}F-fluorodeoxyglucose and ^{13}N-ammonia in stroke and epilepsy, 5:32838 (UCLA—12-1259)

California Univ., Los Angeles (USA). School of Engineering and Applied Science
Studies of the vertical mist transport process for an ocean thermal energy cycle. Final report, 5:31877 (SAN—0034-76-1)

California Univ., Richmond (USA). Sea Water Conversion Lab.
Condensation film coefficients for mixtures of isobutane and isopentane, 5:32117 (LBL—11025)

California Univ., Riverside (USA). Dept. of Soil and Environmental Sciences
Arid land plants: promising new tools for economic development and basic research, 5:31832 (CONF-800840—1)
Screening Prosopis (mesquite) germplasm for biomass production and nitrogen fixation, 5:31829 (CONF-800141—1)
Technical paper on energy farming of desert species, 5:31831 (CONF-800761—1)

California Univ., San Diego, La Jolla (USA). Energy Center
Impact of controls in passive solar heating and cooling of buildings, 5:31978 (DOE/AL/10891—T1)

Carnegie-Mellon Inst. of Research, Pittsburgh, PA (USA)
Design and simulation of a recirculating bed reactor for coal hydrogasification. Final report, Part I. Recirculating bed hydrogasifier conceptual design and simulation results, 5:31472 (FE—3031-5(Pt.1))
Design and simulation of a recirculating bed reactor for coal hydrogasification. Final report, Part II. Software documentation of the non-linear simulator, 5:31473 (FE—3031-5(Pt.2))
Design and simulation of a recirculating bed reactor for coal hydrogasification. Final report, Part III. Linear programming analysis of hydrogasification strategies, 5:31474 (FE—3031-5(Pt.3))

Carnegie-Mellon Univ., Pittsburgh, PA (USA)
Development of a Foam OTEC System. Final technical report for Fiscal Year 1979, 5:31875 (ORNL/Sub—7654/1)

Carnegie-Mellon Univ., Pittsburgh, PA (USA). Dept. of Chemistry
Experimental nuclear and radiochemistry. Progress report, February 1, 1979-January 31, 1980, 5:32983 (COO—4721-2)
CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Surete Nucleaire
Calculation of pollutant transfer in an aquifer TRIDISOL A1, A2, and 3 codes. Report DSN No. 270, 5:32783 (DOE/CEA/BMFT—8)
Human factors: human failures and incidents. Application to the St. Laurent power stations, SL1 and SL2. Report DSN No. 283, 5:32335 (DOE/CEA/BMFT—1)
Method for previsional evaluation of pollutant transfers in an aquifer. First results obtained in a sandy environment (at the BARP workings, GARONDE). Report DSN No. 261, 5:32784 (DOE/CEA/BMFT—9)
Center for Occupational Research and Development, Waco, TX (USA)
Environmental and chemical analysis technician curriculum planning guide. Final report, 5:32198 (EPRI-CS—1464)
Chicago Univ., IL (USA)
Molecular biology of environmental aromatic hydrocarbons. Progress report, January 1, 1980-December 31,1980, 5:32869 (DOE/EV/10328—1)
Chicago Univ., IL (USA). Center for Urban Studies
Costs and water quality effects of controlling point and nonpoint pollution sources, 5:32804 (ANL/ES—99)
Costs and water quality effects of wastewater treatment plant centralization, 5:32803 (ANL/ES—98)
Citizens Mutual Savings and Loan Association, Leavenworth, KS (USA)
Solar heating and cooling system installed at Leavenworth, Kansas. Final report, 5:31992 (DOE/NASA/CR—161484)
Clinch River Breeder Reactor Plant Project Office, Oak Ridge, TN (USA)
Quality assurance in technology development for The Clinch River Breeder Reactor Plant Project, 5:32229 (CONF-800927—1)
Coast Guard Research and Development Center, Groton, CT (USA)
Coast guard evaluation of a wave activated turbine generator buoy. Final report Jan 73—Sep 77, 5:32159 (AD-A—076133)
Colorado Geological Survey, Denver (USA)
Colorado geothermal institutional handbook: a user's guide of agencies regulations, permits, and aids for geothermal development, 5:32102 (DOE/ID/12018—3)
Colorado State Univ., Fort Collins (USA)
Fourth quarterly progress report, January 15, 1980-May 15, 1980, 5:31862 (SERI/PR—8802-9-T4)
Novel concepts in electrochemical solar cells. Second quarterly progress report, August 15, 1979-October 15, 1979, 5:31860 (SERI/PR—8802-9-T2)
Novel concepts in electrochemical solar cells. Third quarterly progress report, November 15, 1979-January 15, 1980, 5:31861 (SERI/PR—8802-9-T3)
Colorado State Univ., Fort Collins (USA). Dept. of Atmospheric Science
Effects of atmospheric variability on energy utilization and conservation. Final report, 1 January 1979-31 December 1979, 5:32434 (COO—1340-69)
Colorado State Univ., Fort Collins (USA). Dept. of Electrical Engineering
Fabrication and characterization of ITO/silicon SIS solar cells. Final report, October 1, 1978-April 30, 1980, 5:31824 (SERI/TR—8232-1-T1)
Novel concepts in electrochemical solar cells. First quarterly progress report, May 15-July 15, 1979, 5:31859 (SERI/PR—8802-9-T1)
Colorado State Univ., Fort Collins (USA). Dept. of Mechanical Engineering
Optimal control studies of solar heating systems, 5:32021 (COO—4519-1)
Colorado Univ., Boulder (USA)
Cross section and analyzing power in the $^{206}Pb(\rightarrow t,p)\ ^{208}Pb(4^-)$ reaction, 5:33027 (LA-UR—80-1920)
Colorado Univ., Denver (USA). Center for Environmental Studies
Pollution of ground water due to inactive uranium mill tailings. Summary of progress, October 1, 1979-September 30, 1981, 5:32785 (DOE/ET/44206—1)
Concentration Specialists, Inc., Andover, MA (USA)
Investigation of freeze concentration as a process for industrial energy conservation in black liquor, acetic acid, and citrus juice applications. Final report, 5:32487 (DOE/CS/40034—T1)
Connecticut Univ., Storrs (USA)
A scientific study to develop a practical method for assessing the cleanup of 'sour' (high sulfur) crude oil spills in littoral sands using benthic microorganisms. Final report, 5:31584 (AD-A—075763)
Cornell Aeronautical Lab., Inc., Buffalo, NY (USA)
Development of low alloy ti-b steels for high temperature service applications. Technical report, 5:32542 (AD-A—076038/9)
Corps of Engineers, Seattle, WA (USA). Seattle District
Electrical energy in the Pacific Northwest. Final report 1975-1995, 5:32186 (AD-A—075693)
Corpus Christi State Univ., TX (USA). National Spill Control School
National Spill Control School. A pilot program in environmental training. Final report, 5:31585 (DOE/EV/04995—T1)

D

Daedalean Associates, Inc., Woodbine, MD (USA)
Research on cavitating hydrojet descaling techniques for improving the efficiency of industrial boiler tubes, 5:32488 (DOE/OR/05379—T1)
Dallas Independent School District, TX (USA). Office of the General Superintendent
Solar heating and domestic hot water system installed at North Dallas High School. Final report, 5:31990 (DOE/NASA/CR—161482)
Dames and Moore, San Francisco, CA (USA)
Analysis of AEC-ERDA-DOE and USGS uranium program data: disipline reviews and summary reports. Final report, 5:31620 (EPRI-EA—1374)
David W. Taylor Research and Development Center, Bethesda, MD (USA)
No-load testing of the shaped field super-conductive motor. Final report, 5:32684 (AD-A—076125)
Dayton Univ., OH (USA)
Probe effects in gas turbine combustor emissions measurements. Final report 1 Mar—1 Oct 78, 5:32514 (AD-A—076257)
Defence Research Establishment Valcartier, Courcelette, Quebec (Canada)
Performance and diagnostics of lasers initiated by the reaction of NO with ClO_2, 5:32690 (AD-A—076010)
Defense Intelligence Agency, Washington, DC (USA)
Bibliography of soviet laser developments, number 38, November—December 1978, 5:32689 (AD-A—075784)
Department of Agriculture, New Orleans, LA (USA)
Sugarcane spacing. II. Effects of spacing on the plant, 5:31835 (DOE/ET/20002—T1)
Department of Energy, Bartlesville, OK (USA). Bartlesville Energy Technology Center
Liquid fossil fuel technology. Quarterly technical progress report, October-December 1979, 5:31556 (DOE/BETC/QPR—79/4)
Systematic study of metal ion sorption on selected geologic media. Annual report, October 1978-December 1979, 5:32782 (DOE/BETC/OR—14)
Department of Energy, Las Vegas, NV (USA). Nevada Operations Office
Nevada Nuclear Waste Storage Investigations. FY 1979 peer review summaries and related documentation, 5:31695 (NVO—196-16)
Department of Energy, Morgantown, WV (USA). Morgantown Energy Technology Center
Development of a simple fluidized-bed coal combustion model for the assessment of a pressurized fluidized-bed combustion system for electrical power generation, 5:32709 (DOE/METC/SP—80/15)
Department of Energy, Oak Ridge, TN (USA). Technical Information Center
Current energy patents. Abstracts 1 to 423, 5:33151 (CEP—80/1)
Energy Information Data Base: corporate author entries, 5:33168 (DOE/TIC—4585-R1(Suppl.5))
Nuclear medicine: a bibliography, 5:32841 (TID—3319-S8-P1)
Nuclear medicine: a bibliography, 5:32842 (TID—3319-S8-P2)
Nuclear reactors: built, being built, or planned in the United States as of Dec 31, 1979, 5:32212 (DOE/TIC—8200-R41)
Department of Energy, Washington, DC (USA)
Basic research needs in seven energy-related technologies, conservation, conversion, transmission and storage, environmental fission, fossil, geothermal, and solar, 5:32379 (DOE/ER—0060)

Draft environmental impact statement: supplement. Energy performance standards for new buildings, 5:32436 (DOE/EIS—0061/DS-1)
Draft environmental impact statement for review and establishment of natural gas curtailment priorities, 5:31608 (DOE/EIS—0065)
Gas evolution from geopressured brines, 5:32157 (DOE/TIC—11227)
Report of the Energy Research Advisory Board on gasohol, 5:31838 (DOE/TIC—11238)

Department of Energy, Washington, DC (USA). Assistant Secretary for Conservation and Solar Energy
Co-sponsored second quarter progress review conference on district heating, 5:32501 (CONF-800598—)

Department of Energy, Washington, DC (USA). Assistant Secretary for Environment
Final environmental statement: Great Plains Gasification Project, Mercer County, North Dakota, 5:31532 (DOE/EIS—0072-F(Vol.1))
Final environmental statement: Great Plains Gasification Project, Mercer County, North Dakota, 5:31533 (DOE/EIS—0072-F(Vol.2))
Final environmental statement: Great Plains Gasification Project, Mercer County, North Dakota, 5:31534 (DOE/EIS—0072-F(Vol.3))

Department of Energy, Washington, DC (USA). Div. of Technology Assessments
Technology Characterizations. Environmental Information Handbook, 5:32820 (DOE/EV—0072)

Department of Energy, Washington, DC (USA). Energy Information Administration
Alaskan hydrocarbon supply model: methodology description, 5:32403 (DOE/EIA—0103/22)
Annual report to Congress. Volume 2. Data, 5:32400 (DOE/EIA—0173(79)/2)
Base case projections of petroleum supply/demand through the first quarter of 1980, 5:32402 (DOE/EIA—0102/49)
Bituminous and subbituminous coal and lignite distribution, January-June 1979. Energy data report, 5:31543 (DOE/EIA—0125-2Q79)
Commercial and industrial storage of distillate and gasoline. A study required by Section 241 of the Emergency Energy Conservation Act of 1979, 5:31579 (DOE/EIA—0222)
Cost and quality of fuels for electric utility plants, 1979. Energy data report, 5:32195 (DOE/EIA—0191(79))
Energy data report: natural gas deliveries and curtailments to end-use customers and potential needs for additional alternate fuels: 1979-1980 heating season (November-March), 5:31607 (DOE/EIA—0150(79)(80))
Energy policy study. Volume 11. Federal pipeline regulation, 5:31577 (DOE/EIA—0201/11)
Hydroelectric plant construction cost and annual production expenses, 1978. Twenty-second annual supplement, 5:31768 (DOE/EIA—0171(78))
International petroleum annual, 1977, 5:31576 (DOE/EIA—0042/77)
Quarterly report. First quarter 1979, 5:31452 (DOE/EIA—0008/1(79))
Recent Products of Applied Analysis, May-July 1980. Issue No. 4, 5:32363 (DOE/EIA—0203/4)
Secondary stocks: a paper prepared for the American Statistical Association Committee on Energy Statistics, 5:31578 (DOE/EIA—0215)

Department of Energy, Washington, DC (USA). Office of Nuclear Energy Programs
Inservice inspection system development program, 5:32259 (DOE/TIC—11233)

Department of Energy, Washington, DC (USA). Office of State and Local Programs
State Energy Conservation Program Measure Directory. Sourcebook: Volume 8. Part 2 of 2 books, 5:32433 (DOE/CS—0159/2)

Derry, Michener and Booth, Inc., Golden, CO (USA)
Uranium- and thorium-bearing pegmatites of the United States, 5:31626 (GJBX—166(80))

Dikewood Corp., Albuquerque, NM (USA)
Systems engineering programs for geologic nuclear waste disposal, 5:31704 (SAND—80-0440)

Drexel Univ., Philadelphia, PA (USA)
To develop a dynamic model of a collector loop for purpose of improved control of solar heating and cooling. Final technical report, 5:32020 (COO—4512-1)

Duke Univ., Durham, NC (USA)
Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979, 5:32945 (DOE/TIC—11133)

Duke Univ., Durham, NC (USA). Dept. of Zoology
Radiation damage and repair in cells and cell components. Progress report: third new contract year, 5:32860 (ORO—3631-10)

Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.
Californium-252 encapsulation at the Savannah River Laboratory, 5:32673 (DP-MS—79-109)
Corrosion of high Ni-Cr alloys and Type 304L stainless steel in HNO_3-HF, 5:32577 (DP—1550)
Design and operation of small-scale glass melters for immobilizing radioactive waste, 5:31677 (DP-MS—79-108)
Fractography of hydrogen-embrittled iron-chromium-nickel alloys, 5:32546 (DP-MS—80-19)
Grand Canyon 1° x 2° NTMS area: Arizona. Data report, 5:31621 (GJBX—142(80))
Hydrogeochemical and stream sediment reconnaissance: National Uranium Resource Evaluation program. Savannah River Laboratory semi-annual report, October 1979-March 1980, 5:31624 (GJBX—146(80))
Long-term high-level waste technology. Composite quarterly technical report, January-March 1980, 5:31675 (DP—80-157-1)
Vitrification of transuranic and beta-gamma contaminated solid wastes, 5:31676 (DP—1553)
Waste Management Program. Technical progress report, October-December 1979, 5:31670 (DP—79-125-4)

Du Pont de Nemours (E.I.) and Co., Wilmington, DE (USA)
Synthetic crude oils carcinogenicity screening tests. Progress report, September 15, 1979-March 15, 1980, 5:32875 (COO—4758-3)

Du Pont de Nemours (E.I.) and Co., Wilmington, DE (USA). Engineering Dept.
Conceptual design of a spent LWR fuel recycle complex, 5:31649 (DP-MS—80-22)

E

Eagle-Picher Industries, Inc., Miami, OK (USA). Miami Research Labs.
Study program to develop and evaluate die and container materials for the growth of silicon ribbons, 5:31804 (DOE/JPL/954877—78/3)

Eaton Corp., Southfield, MI (USA). Engineering and Research Center
Small passenger car transmission test: Chevrolet 200 transmission, 5:32518 (DOE/NASA/1024—1)

ECP, Inc., El Segundo, CA (USA)
Development of power poles from fly ash. Phase 2. Final report, April 1980, 5:32208 (EPRI-EL—1384)

EG and G GeoMetrics, Sunnyvale, CA (USA)
Aerial gamma ray amd magnetic survey: Mississippi and Florida Survey, Meridian quadrangle of Mississippi and Alabama. Final report, 5:31640 (GJBX—154(80))
Aerial gamma ray and magnetic survey: Mississippi and Florida airborne survey, Springfield quadrangle of Missouri. Final report, 5:31635 (GJBX—149(80))
Aerial gamma ray and magnetic survey: Mississippi and Florida airborne survey, Alexandria quadrangle of Louisiana and Texas. Final report, 5:31638 (GJBX—152(80))
Aerial gamma ray and magnetic survey: Mississippi and Florida airborne survey, Jackson quadrangle of Mississippi and Louisiana. Final report, 5:31639 (GJBX—153(80))
Aerial gamma ray and magnetic survey: Mississippi and Florida airborne survey, Hattiesburg quadrangle of Mississippi, Alabama, and Louisiana. Final report, 5:31641 (GJBX—155(80))
Aerial gamma ray and magnetic survey: Mississippi and Florida airborne survey, Shreveport quadrangle of Louisiana. Final report, 5:31637 (GJBX—151(80))

Aerial gamma ray and magnetic survey: Mississippi and Florida airborne survey, Harrison quadrangle, Missouri and Arkansas. Final report, 5:31636 (GJBX—150(80))

EG and G Idaho, Inc., Idaho Falls (USA)

Ability of the TRAC-P1A computer program to predict blowdown, refill, and reflood phenomena during Semiscale Mod-1 experiments, 5:32312 (CONF-800909—1)

Andco-Torrax incinerator model program description, 5:31510 (EGG-EA—5136)

CAD/CAM: improved design quality, increased productivity, 5:32478 (CONF-800692—1)

GAMSCAN: ATR fuel plate gamma scanning overcheck computer code, 5:32290 (EGG-RE-A—78-279)

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L2-6 fuel prepressurization and initial conditions, 5:32313 (EGG/LTR-LO—14-80-069)

Measurement of velocity vectors in two-phase flows using five hole stagnation probe, 5:32219 (EGG/LTR-LO—00-80-117)

Mechanical properties test data for structural materials. Semiannual progress report for period ending July 31, 1980, 5:32545 (DOE/ID/01570—T10)

5MW Raft River facility experience, 5:32110 (CONF-800681—1)

Operational upset transients in a dual boiling binary cycle geothermal power plant, 5:32112 (CONF-800920—9)

Raft River 5-MW(e) geothermal pilot plant project, 5:32111 (CONF-800920—8)

RELAP4/MOD6 analysis of forced- and gravity-feed reflood tests, 5:32310 (CONF-800723—2)

Ultrasonic properties of austenitic stainless steel welds, 5:32547 (EGG-FM—5160)

EG and G, Inc., Goleta, CA (USA). Energy Measurements Group

Laboratory evaluation of a KrF laser fluorosensor, 5:32745 (EGG—1183-2380)

EIC Corp., Newton, MA (USA)

Analysis of advanced thermal storage subsystems for solar heating and cooling. Final report, October 1, 1977-September 30, 1978, 5:31977 (COO—4483-F)

Electric Power Research Inst., Palo Alto, CA (USA)

Using statistically designed experiments in development of advanced battery systems, 5:32339 (EPRI-EM—1346)

Energy and Environmental Analysis, Inc., Arlington, VA (USA)

Programmatic environmental assessment of the DOE Solar Agricultural and Industrial Process Heat Program, 5:32023 (COO—4879-T1)

Energy Law Inst., Concord, NH (USA). Franklin Pierce Law Center

Analysis of legal obstacles and incentives to the development of low-head hydroelectric power in Maine, 5:31755 (DOE/RA/04934—20)

Case study analysis of legal and institutional obstacles and incentives to the development of the hydroelectric potential at Goose River, Maine, 5:31763 (DOE/RA/04934—32)

Case study analysis of legal and institutional obstacles and incentives to the potential hydroelectric development at High Falls State Park, Georgia, 5:31765 (DOE/RA/04934—34)

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Case study analysis of the legal and institutional obstacles and incentives to the development of the hydroelectric power of the Boardman River at Traverse City, Michigan, 5:31764 (DOE/RA/04934—33)

Case study analysis of the legal and institutional obstacles and incentives to the development of the hydroelectric power at the Maxwell locks and dam, Pennsylvania, 5:31767 (DOE/RA/04934—36)

Executive summary: legal obstacles and incentives to small-scale hydroelectric development in the six middle atlantic states, 5:31743 (DOE/RA/04934—06)

Executive summary: legal obstacles and incentives to the development of small scale hydroelectric potential in the seven mid-western states, 5:31744 (DOE/RA/04934—08)

Fundamental economic issues in the development of small scale hydro, 5:31769 (DOE/RA/04934—02)

Legal obstacles and incentives to the development of small scale hydroelectric potential in Illinois, 5:31745 (DOE/RA/04934—09)

Legal obstacles and incentives to the development of small scale hydroelectric power in Kentucky, 5:31746 (DOE/RA/04934—10)

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Preliminary analysis of legal obstacles and incentives to the development of low-head hydroelectric power in the northeastern United States, 5:31740 (DOE/RA/04934—01)

Summary of the Mid-Atlantic conference on small-scale hydropower in the Mid-Atlantic states: resolution of the barriers impeding its development, 5:31742 (DOE/RA/04934—04)

Summary of the New England conference on legal and institutional incentives to small-scale hydroelectric development (Boston Massachusetts, January 30-31, 1979), 5:31741 (DOE/RA/04934—03)

Engineering Development Establishment, Maribyrnong (Australia)

Laboratory investigation of the performance of a Holden engine operating on liquified petroleum gas, 5:32520 (AD-A—076145)

Engineering Societies Commission on Energy, Inc., Washington, DC (USA)

Materials for coal conversion and use. Volume III. Materials of construction for advanced power systems, 5:31470 (FE—2468-71)

Environmental Protection Agency, Washington, DC (USA). Office of Energy, Minerals and Industry

Federal non-nuclear energy R and D program. Public hearing transcript, 5:32380 (EPA—600/9-78-023)

Environmental Protection Agency, Washington, DC (USA). Office of Research and Development

Industrial wastewater, 5:32495 (EPA—600/8-80-026)

Environmental Research and Technology, Inc., Pittsburgh, PA (USA)

Toxicologic studies of SRC materials, 5:32871 (PNL-SA—8439)

Envirosphere Co., New York (USA)

Airborne uranium, its concentration and toxicity in uranium enrichment facilities, 5:32773 (K/PO/SUB—79/31057/1)

European Organization for Nuclear Research, Geneva (Switzerland)

Survey of beam-beam limitations, 5:32715 (BNL—27973)

EUS, Inc., Pittsburgh, PA (USA)

Dual energy use systems: district heating survey. Final report, 5:32502 (EPRI-EM—1436)

Evaluation of load-management systems and devices: technical planning study TPS 78-807. Final report, June 1980, 5:32406 (EPRI-EM—1423)
Exoil Services, Golden, CO (USA)
Analysis of reservoir pretreatment in chemical flooding: a literature review, 5:31562 (DOE/BC/10027—11)
Exxon Nuclear Co., Inc., Richland, WA (USA)
External attachment of titanium sheathed thermocouples to zirconium nuclear fuel rods for the LOFT reactor, 5:32286 (CONF-800719—4)
Internal attachment of laser beam welded stainless steel sheathed thermocouples into stainless steel upper end caps in nuclear fuel rods for the LOFT Reactor, 5:32287 (CONF-800719—5)
Sphere-pac fuel development program. First semi-annual progress report, October 1979-March 1980, 5:32275 (DOE/ET/34026—1)
Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA)
Investigation of the properties of UO_3 in a fluidized-bed denitration unit, 5:31646 (ENICO—1041)
Properties of vitrified ICPP zirconia calcine, 5:31678 (ENICO—1038)
Exxon Research and Engineering Co., Florham Park, NJ (USA)
EDS coal liquefaction process development. Phase V. Monthly technical progress report, June 1-June 30, 1980, 5:31486 (FE—2893-52)
Exxon Research and Engineering Co., Florham Park, NJ (USA). Engineering Technology Dept.
Industrial application fluidized bed combustion. Category III: indirect fired heaters. Quarterly technical report No. 16, April 1-June 30, 1980, 5:31551 (DOE/ET/10379—T1)
Exxon Research and Engineering Co., Linden, NJ (USA). Advanced Energy Systems Labs.
Spray solar cell research: CdS/Cu_2S cells by ion exchange-CSD. Quarterly report No. 1, October 1-December 31, 1979, 5:31813 (DSE—4042-T20)
Exxon Research and Engineering Co., Linden, NJ (USA). Government Research Labs.
Alternative energy sources for non-highway transportation. Appendices, 5:32464 (DOE/CS/05438—T1(Vol.3))

F

Faucett (Jack) Associates, Inc., Chevy Chase, MD (USA)
Analytical framework for evaluating energy and capacity shortages. Final report, 5:32393 (EPRI-EA—1215(Vol.2))
Ford Motor Co., Dearborn, MI (USA)
Automotive Stirling Engine Development Program, 5:32516 (DOE/NASA/4396—4)
Fraser/Associates, Washington, DC (USA)
Providing for energy efficiency in homes and small buildings: teacher guide, 5:32510 (DOE/IR/06065—1(Pt.4))
Friends of the Earth, San Francisco, CA (USA). International Project for Soft Energy Paths
Decentralized energy studies: compendium of international studies and research, 5:32383 (SERI/RR—744-451)

G

General Accounting Office, Washington, DC (USA)
Changes in public-land management required to achieve Congressional expectations, 5:32373 (CED—80-82)
Domestic aluminum resources: dilemmas of development, 5:32523 (EMD—80-63(Vol.1))
Domestic aluminum resources: dilemmas of development. Volume II. Appendixes II-VII: detailed agency comments and GAO response, 5:32524 (EMD—80-63(Vol.2))
How the petroleum-refining industry approaches energy conservation: a case study, 5:31571 (EMD—80-55)
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General Atomic Co., San Diego, CA (USA)
Analysis of experiments in the Phase III GCFR benchmark critical assembly, 5:32233 (GA-A—15602)
GCFR plant control system, 5:32282 (GA-A—15891)
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Refueling system for the gas-cooled fast breeder reactor, 5:32236 (GA-A—15918)
General Electric Co., Bridgeport, CT (USA)
Extruded dielectric dc cable development. Final report, 5:32211 (EPRI-EL—1386)
General Electric Co., San Jose, CA (USA)
Determining the mode of high voltage breakdowns in vacuum devices, 5:32701 (GEPP-OP—473)
General Electric Co., San Jose, CA (USA). Nuclear Energy Div.
Safety analysis of thorium-based fuels in the General Electric Standard BWR, 5:32324 (ORNL/SUB—7537/14)
General Electric Co., San Jose, CA (USA). Nuclear Engineering Div.
Behavior of unirradiated zirconium-lined and copper-plated Zircaloy-2 tubing under simulated PCI conditions, 5:32214 (GEAP—25093)
General Electric Co., Santa Barbara, CA (USA). Center for Advanced Studies
Gas reactor international cooperative program: HTR market assessments, 5:32261 (COO—4057-11)
General Electric Co., Schenectady, NY (USA)
Texaco-based gasification-combined-cycle system performance studies. Final report, 5:31466 (EPRI-AP—1429)
General Electric Co., Schenectady, NY (USA). Corporate Research and Development Dept.
Behavior of unirradiated zirconium-lined and copper-plated Zircaloy-2 tubing under simulated PCI conditions, 5:32214 (GEAP—25093)
Development of molten carbonate fuel cells for power generation. Final report, August 1977-December 1979, 5:32430 (SRD—80-055)
General Electric Co., Schenectady, NY (USA). Electrical Systems and Technology Lab.
Development of a HVDC prototype breaker. Final report, 5:32210 (DOE/ET/29054—1)
General Electric Co., Schenectady, NY (USA). Energy Systems Programs Dept.
Electrostatic granular bed filter development program. Quarterly technical report, April-June 1980, 5:31552 (FE—5490-7)
PFB Coal Fired Combined Cycle Development Program. Advanced hot gas cleanup concept evaluation (Task 4.3). Volume A. Aerodyne cyclone evaluation, 5:32191 (FE—2357-39)
PFB Coal Fired Combined Cycle Development Program. Advanced cleanup device performance design report (Task 4.3). Volume B. Air shield cyclone evaluation, 5:32192 (FE—2357-70)
General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.
Application of word processing to engineering documentation, 5:33169 (GEPP-TIS—519)
Crack analysis, glass-ceramic insulator of vacuum tube, 5:32704 (GEPP-TIS—511)
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Improving the voltage holdoff performance of alumina insulators in vacuum by quasimetallizing or doping, 5:32702 (GEPP-OP—476)
Improving the voltage holdoff performance of alumina insulators in vacuum by quasimetallizing or doping, 5:32703 (GEPP-TIS—476)
General Electric Co., Sunnyvale, CA (USA). Advanced Reactor Systems Dept.
Gas Reactor International Cooperative Program. Interim report: assessment of gas-cooled reactor economics, 5:32221 (COO—4057-4(Vol.1))

Geodata International, Inc., Dallas, TX (USA)
Aerial radiometric and magnetic survey: Del Rio National Topographic Map, Texas. Final report, 5:31642 (GJBX—156(80))
Aerial radiometric and magnetic survey: Eagle Pass National Topographic Map, Texas. Final report, 5:31643 (GJBX—157(80))
Geological Survey, Denver, CO (USA)
Geological interpretation of self-potential data from the Cerro Prieto geothermal field, 5:32094 (LBL—9544)
Geological Survey, Denver, CO (USA). Conservation Div.
Mathematical solutions of parametric pulsed production of single phase flow through porous media, 5:31566 (MER—10.1(P-35))
Geological Survey, Menlo Park, CA (USA)
Analysis of thermal data from drill holes UE25a-3 and UE25a-1, Calico Hills and Yucca Mountain, Nevada Test Site, 5:32096 (USGS-OFR—80-826)
Georgetown Univ., Washington, DC (USA)
Energy system for the Georgetown University Academic Building. Volume I. Executive summary, final report, 5:32460 (DOE/ET/23136—T1(Vol.1))
Georgia Univ., Athens (USA). Dept. of Entomology
Comparison of mineral element cycling under till and no-till practices: an experimental approach to agroecosystems analysis, 5:32857 (DOE/EV/00641—40)
Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht-Tesperhude (Germany, F.R.). Inst. fuer Anlagentechnik
Physical model of lean suppression pressure oscillation phenomena: steam condensation in the light water reactor pressure suppression system (PSS), 5:32329 (UCRL—84151)
Gilbert/Commonwealth, Reading, PA (USA)
Feasibility study: fuel cell cogeneration in a water pollution control facility. Final report, 5:32427 (DOE/ET/12431—T1(Vol.2))
Giner, Inc., Waltham, MA (USA)
Study of aluminum corrosion in aluminum solar heat collectors using aqueous glycol solution for heat transfer. Semiannual technical progress report, July 30, 1979-January 31, 1980, 5:32149 (DOE/CS/31072—T1)
Golder Associates, Inc., Kirkland, WA (USA)
Case study data base companion report 3 to simulation of geothermal subsidence (LBL-10571), 5:32105 (LBL—10839)
Gould-Brown Boveri, Colmar, PA (USA)
Prototype fault current limiter. Final report, 5:32209 (EPRI-EL—1396)
Grace, Sursen, Moore and Associates, Amarillo, TX (USA)
Directional drilling equipment and techniques for deep hot granite wells, 5:32119 (LA-UR—80-2086)
Gruy Federal, Inc., Houston, TX (USA)
Investigation and evaluation of geopressured-geothermal wells. Final report: Beulah Simon No. 2 Well, Vermilion Parish, Louisiana. Volume I. Completion and testing, 5:32128 (DOE/ET/28460—3(Vol.1))
Investigation and evaluation of geopressured-geothermal wells. Final report: Beulah Simon No. 2 Well, Vermilion Parish, Louisiana. Volume II. Analytical data, 5:32129 (DOE/ET/28460—3(Vol.2))
Gulf Mineral Resources, Denver, CO (USA)
Toxicologic studies of SRC materials, 5:32871 (PNL-SA—8439)

H

Hanford Engineering Development Lab., Richland, WA (USA)
FFTF irradiation of fracture mechanics specimens for out-of-core structures, 5:32249 (HEDL-TC—1213)
Advanced absorber assembly design for breeder reactors, 5:32283 (HEDL-SA—1995-FP)
Aerosol measurement techniques and accuracy in the CSTF, 5:32316 (HEDL-SA—1981-FP)
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Comparison of aerosol behavior during sodium fires in CSTF with the HAA-3B code, 5:32317 (HEDL-SA—1982-FP)
Control of radioactive material transport in sodium-cooled reactors, 5:32245 (HEDL-SA—1988)
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FFTF sodium and cover gas characterization and purification, 5:32291 (HEDL-SA—1874-FP)
FFTF utilization for irradiation testing, 5:32300 (HEDL-SA—2083)
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HEDL W-1 SLSF experiment LOPI transient and boiling test results, 5:32318 (HEDL-SA—2012-FP)
Hydrogen permeation resistant layers for liquid metal reactors, 5:32240 (HEDL-SA—1875-FP)
Initial physics measurements on FFTF, 5:32303 (HEDL-SA—2163)
Instrumented fuels test for FFTF, 5:32296 (HEDL-SA—2007)
Liquid metal reactions under postulated accident conditions for fission and fusion reactors, 5:32320 (HEDL-SA—2131-FP)
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Surveillance and in-service inspection (SISI) program at FFTF, 5:32298 (HEDL-SA—2028)
Thermophysical properties of selected wear-resistant alloys, 5:32559 (HEDL-TME—79-6)
Harvard Univ., Cambridge, MA (USA). Div. of Applied Sciences
Experimental test of resonant absorption theory. Final report, January 1, 1978-December 31, 1979, 5:33096 (COO—4631-11)
Hawaii Univ., Honolulu (USA). Hawaii Inst. of Geophysics
Investigation of geothermal potential in the Waianae Caldera Area, Western Oahu, Hawaii. Assessment of Geothermal Resources in Hawaii: Number 2, 5:32090 (HIG—79-8)
Potential geothermal resources in Hawaii: a preliminary regional survey. Phase I, final report, 5:32077 (HIG—79-4)
Temperature profiles in wells on the island of Hawaii, 5:32092 (HIG—79-7)
Hemlock Semiconductor Corp., MI (USA)
Silicon materials task of the Low-Cost Solar Array Project (Phase IV). Effects of impurities and processing on silicon solar cells. Nineteenth quarterly report, April 1980-June 1980, 5:31794 (DOE/JPL/954331—80/11)
Hittman Associates, Inc., Columbia, MD (USA)
Dual energy use systems: district heating survey. Final report, 5:32502 (EPRI-EM—1436)
Holt (Ben) Co., Pasadena, CA (USA)
Geothermal heating demonstration project at Mammoth Lakes Village. Final report, 5:32152 (P—500-80-009)

Honeywell Corporate Material Sciences Center, Bloomington, MN (USA)
Development of fluorides for high power laser optics. Final report, 1 April 1978-31 March 1980, 5:33121 (NVO—1555-5)
Silicon-on ceramic process: silicon sheet growth and device development for the large-area silicon sheet task of the Low-Cost Solar Array Project. Quarterly report NO. 15, April 1, 1980-June 30, 1980, 5:31798 (DOE/JPL/954356—80/13)
Supported growth of polycrystalline silicon sheet on low-cost ceramic, carbon, or reusable substrate. Quarterly report No. 1, September 26-December 31, 1979, 5:31814 (DSE—4042-T22)
Honeywell, Inc., Minneapolis, MN (USA). Energy Resources Center
Installation guidelines for solar heating system, single-family residence at William O'Brien State Park, Stillwater, Minnesota, 5:31989 (DOE/NASA/CR—161480)
Honeywell, Inc., Minneapolis, MN (USA). Technology Strategy Center
Survey mirrors and lenses and their required surface accuracy. Volume 1. Technical report. Final report for September 15, 1978-December 1, 1979, 5:32045 (DOE/CS/35348—T1(Vol.1))
Survey mirrors and lenses and their required surface accuracy. Volume 2. Concentrator optical performance software (COPS) user's manual. Final report for September 15, 1978-December 1, 1979, 5:32046 (DOE/CS/35348—T1(Vol.2))
Hospital Council of Southern California, Los Angeles (USA)
Energy use surveys for six hospitals: pilot project. Final report, 5:32462 (P—400-80-063)
Hughes Research Labs., Malibu, CA (USA)
Indium phosphide/cadmium sulfide thin-film solar cells. Quarterly technical progress report No. 1, June 1979-August 1979, 5:31812 (DSE—4042-T9)
Neutral beam source commercialization study. Final report, 5:33115 (LBL—11261)
Hydrologic Engineering Center, Davis, CA (USA)
Feasibility studies for small scale hydropower additions. A Guide Manual, 5:31738 (DOE/RA—0048)

I

IBM Federal Systems Div., Huntsville, AL (USA)
Solar Energy System Economic Evaluation. Final report for Elam-Tempe, Tempe, Arizona and Elcam-San Diego, San Diego, California, 5:32037 (DOE/NASA/CR—161492)
Solar Energy System Economic Evaluation. Final report for IBM System 2, Togus, Maine, 5:32038 (DOE/NASA/CR—161510)
Solar Energy System Performance Evaluation. Seasonal report for Contemporary Newnan, Newnan, Georgia, 5:31994 (DOE/NASA/CR—161494)
Solar Energy System Performance Evaluation. Seasonal report for IBM System 1B, Carlsbad, New Mexico, 5:31996 (DOE/NASA/CR—161508)
Idaho National Engineering Lab., Idaho Falls (USA)
Dry cooling tower operating experience in the LOFT reactor, 5:32288 (CONF-800804—4)
Experimental data report for transient flow calibration facility tests IA101, IA102 and IA103, 5:32289 (EGG-L—0-00-80-114)
Light-water reactor safety analysis codes, 5:32322 (LA-UR—80-1414)
Plasma diagnostics approach to welding heat source/molten pool interaction, 5:32743 (CONF-800922—1)
Semiannual progress report for the Idaho Geothermal Program, October 1, 1979-March 31, 1980, 5:32108 (EGG—2034)
WRRD monthly report, June 1980, 5:32315 (EGG/YBR—90-80)
WRRD monthly report, May 1980, 5:32314 (EGG/YBR—81-80)
IIT Research Inst., Chicago, IL (USA)
Design, engineering and evaluationn of refractory liners for slagging gasifiers. Seventh quarterly technical progress report, April 1-June 30, 1980, 5:31475 (IITRI-M—6043-7)
Survivability in a nuclear weapon environment. Final report 30 Sep 77-30 Apr 79, 5:33170 (AD-A—076026)
Illinois State Geological Survey, Urbana (USA)
Geologic and geochemical studies of the New Albany Group (Devonian Black Shale) in Illinois to evaluate its characteristics as a source of hydrocarbons. Quarterly progress report, January 1-March 31, 1980, 5:31612 (DOE/ET/12142—T1)
Illinois Univ., Urbana (USA)
Light-induced electron transfer vs. energy transfer in molecular thin-film systems, 5:32661 (DOE/ER/01198—1306)
User's guide for RFPBRN, a one-dimensional transport and stability code, 5:33082 (COO—2218-164)
Illinois Univ., Urbana (USA). Dept. of Ceramic Engineering
Ferroelectric ceramics for dielectric power conversion. Annual report, March 1, 1979-April 30, 1980, 5:32432 (DOE/ER/04679—3)
Illinois Univ., Urbana (USA). Dept. of Civil Engineering
Biological conversion of biomass to methane. Final report, June 1, 1976-January 31, 1980, 5:31833 (COO—2917-16)
Illinois Univ., Urbana (USA). Fusion Studies Lab.
One-dimensional thermonuclear burn computations for the Reversed-Field Pinch Reactor (RFPR), 5:33081 (COO—2218-154)
Indiana Univ., Bloomington (USA). Dept. of Biology
Light-dependent hydrogen production by C. reinhardi, 5:31853 (CONF-790541—63)
Institute for Water Resources (Army), Fort Belvoir, VA (USA)
Feasibility studies for small scale hydropower additions. A Guide Manual, 5:31738 (DOE/RA—0048)
National Hydroelectric Power Resources Study. Preliminary inventory of hydropower resources. Volume 1. Pacific Northwest Region. Interim report, 5:31732 (AD-A—075962)
National Hydroelectric Power Resources Study. Preliminary inventory of hydropower resources. Volume 2. Pacific Southwest Region. Interim report, 5:31733 (AD-A—075963)
National Hydroelectric Power Resources Study. Preliminary inventory of hydropower resources. Volume 3. Mid-continent Region. Interim report, 5:31734 (AD-A—075964)
National Hydroelectric Power Resources Study. Preliminary inventory of hydropower resources. Volume 4. Lake Central Region. Interim report, 5:31735 (AD-A—075965)
National Hydroelectric Power Resources Study. Preliminary inventory of hydropower resources. Volume 5. Southeast Region. Interim report, 5:31736 (AD-A—075966)
National Hydroelectric Power Resources Study. Preliminary inventory of hydropower resources. Volume 6. Northeast Region. Interim report, 5:31737 (AD-A—075967)
Institute of Ecology, Indianapolis, IN (USA)
Role of organic soils in the world carbon cycle: problem analysis and research needs, 5:32776 (CONF-7905135—)
Institute of Gas Technology, Chicago, IL (USA)
Advanced residential furnaces, 5:32448 (CONF-800642—4)
Electrochemical photovoltaic cells. Project 65021 quarterly technical progress report, October 15, 1979-January 15, 1980, 5:31857 (DSE—4042-T26)
Environmental assessment of HYGAS Pilot Plant streams, 5:31531 (CONF-800602—8)
Model for attrition in fluidized beds, 5:31550 (CONF-800838—1)
PEAT: an energy alternative, 5:31537 (CONF-800759—1)
Peat as an energy alternative, 5:31538 (DOE/ET/10283—T1)
Preparation of a coal conversion systems technical data book, 5:31459 (CONF-800610—9)
International Business Machines Corp., Huntsville, AL (USA). Federal Systems Div.
Solar energy system performance evaluation - Seasonal Report for Seeco Lincoln, Lincoln, Nebraska, 5:31995 (DOE/NASA/CR—161495)
Solar Energy System performance evaluation: seasonal report for Colt Pueblo, Pueblo, Colorado, 5:31993 (DOE/NASA/CR—161493)
Internationale Atomreaktorbau G.m.b.H. (INTERATOM), Bergisch Gladbach (Germany, F.R.)
Expansion joints for LMFBR, 5:32231 (DOE/CEA/BMFT—17)
International Nickel Co., Inc., Suffern, NY (USA). INCO Research and Development Center
Evaluation of high chromium overlays to protect less alloyed substrates from corrosion in a coal gasification atmosphere. Quarterly report, December 1, 1978-February 28, 1979, 5:31471 (FE—2621-10)
Iowa State Univ. of Science and Technology, Ames (USA)
Multiple scattering theory and applications for intermediate energy reactions of nuclei, 5:33047 (IS-T—883)
Iowa State Univ. of Science and Technology, Ames (USA). Dept. of Chemical Engineering
Status of chemical coal cleaning processes, 5:31546 (IS-M—275)

J

JBF Scientific Corp., Arlington, VA (USA)
Proceedings of the fourth biennial conference and workshop on wind energy conversion systems, 5:32175 (CONF-791097—)
JBF Scientific Corp., Wilmington, MA (USA)
Wind energy systems. Application to regional utilities. , 5:32169 (DOE/ET/20063—T1(Exect.Summ.))
Wind energy systems application to regional utilities, 5:32170 (DOE/ET/20063—T1(Vol.2))
Jet Propulsion Lab., Pasadena, CA (USA)
Assessment of inductive coupling roadway powered vehicles, 5:32517 (JPL-PUBL—79-115)
Conference and workshop on coal use for California. Coal use for California: problems and perspectives. Final report, 5:31553 (JPL-PUBL—79-72)
Low-Cost Solar Array Project. Progress report 14, August 1979-December 1979 and proceedings of the 14th Project Integration Meeting, 5:31792 (DOE/JPL—1012-42)
Price allocation guidelines January 1980: Low-cost solar array project, 5:31793 (DOE/JPL—1012-47)
Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.
Geothermal energy development in the Eastern United States. Technical assistance report No. 4. Geothermal space heating: Pittsville Middle/Elementary School, Pittsville, Maryland, 5:32151 (JHU/APL-QM—80-101)

K

Kaba Associates, Inc., Washington, DC (USA)
Final proceedings of the Third Solar Heating and Cooling Demonstration Program Contractors' Review, 5:31880 (CONF-791239—)
Kansas State Univ., Manhattan (USA). Dept. of Forestry
University of Kansas energy forest. Final report to the Ozarks Regional Commission, 5:31849
Kayex Corp., Rochester, NY (USA)
Continuous Czochralski growth: silicon sheet growth development of the large area silicon sheets task of the Low Cost Silicon Solar Array Project. Ninth quarterly progress report, October 1-December 31, 1979, 5:31806 (DOE/JPL/954888—79/9)
Kentucky Univ., Lexington (USA). Dept. of Geology
Bibliography of the paleontology and paleoecology of the Devonian-Mississippian black-shale sequence in North America, 5:31613 (DOE/METC/5202—13)
Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.)
Primary report: the effect of externally mounted thermocouples on cladding temperature behavior during blowdown transients. Part II. Experimental procedure and data, 5:32306 (INEL-tr—51)
Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik
Theoretical investigations of the meltoff and resolidification process of fuel claddings during accidents in liquid metal cooled fast breeder reactors, 5:32332 (DOE-tr—151)
Koeln Univ. (Germany, F.R.). Energiewirtschaftliches Inst.
Progress report, January 1-December 31, 1979, 5:32381 (NP—25007)
KVB, Inc., Irvine, CA (USA)
Status of combustion-modification technology for utility-boiler NO/sub x/ control, 5:31549 (ANL/ECT/TM—1)

L

Lamar Univ., Beaumont, TX (USA). Dept. of Chemical Engineering
Process feasibility study in support of silicon material, Task I. Quarterly technical progress report (XVIII), December 1, 1979-February 29, 1980, 5:31797 (DOE/JPL/954343—80/18)
League for Innovation in the Community Coll., Los Angeles, CA (USA)
Training Community College faculty in the techniques and skills required for Solar Energy System installation, 5:31988 (DOE/CS/34223—01)
Lockheed Missiles and Space Co., Palo Alto, CA (USA). Research Labs.
Cadmium sulfide/copper sulfide heterojunction cell research. Technical progress report, September 1-November 30, 1979, 5:31817 (DSE—8033-1/3)
Los Alamos Scientific Lab., NM (USA)
Alignment and focusing device for a multibeam laser system, 5:33119 (LA-UR—80-1885)
Alpha-particle considerations relevant to the Reversed-Field Pinch Reactor (RFPR), 5:33084 (LA-UR—80-2220)
Applications of industrial computed tomography at Los Alamos Scientific Laboratory, 5:32699 (LA-UR—80-1277)
Applied nuclear data research and development. Progress report, October 1-December 31, 1979, 5:32946 (LA—8298-PR)
Applied nuclear data research and development. Progress report, January 1-March 31, 1980, 5:32948 (LA—8418-PR)
Automation of the enzyme immunoassay for the serodiagnosis of infectious diseases in cattle, 5:32827 (LA-UR—80-1904)
Calculability of the n-p mass difference in gauge theories, 5:32935 (LA-UR—80-2450)
Calibration models for fractured igneous rock environments, 5:32099 (LA-UR—80-1903)
Chemistry and processability of crude oil asphaltenes as studied by ultracentrifugation, 5:31572 (LA-UR—80-1439)
Comparative assessment of nuclear fuel cycles. Light-water reactor once-through, classical fast breeder reactor, and symbiotic fast breeder reactor cycles, 5:32260 (LA—8291-MS)
Comparison of finite-element stress analysis with experimental copper sphere impacts, 5:31726 (LA—8296)
Computational methods for LMFBR whole-core accident analysis, 5:32323 (LA-UR—80-1459)
Conceptual physics design of a compact torus fusion reactor (CTOR), 5:33100 (LA—8448-MS)
Critical CRBR core pressure, 5:32251 (LA—8415-MS)
Cross section and analyzing power in the $^{206}Pb(\rightarrow t,p)\,^{208}Pb(4^-)$ reaction, 5:33027 (LA-UR—80-1920)
Cytogenetic effects of shale-derived oils and related by-products in mice, 5:32876 (LA—8445-MS)
Data acquisition and control for gamma scanning, 5:32729 (LA-UR—80-1358)
Deflagration-to-detonation transition in granular HMX, 5:32750 (LA-UR—80-2016)
Department of Energy research in utilization of high-performance computers, 5:33160 (LA—8470-MS)
Directional drilling equipment and techniques for deep hot granite wells, 5:32119 (LA-UR—80-2086)
DOE-2 reference manual, 5:32443 (LA—7689-M(Ver.2.1)(Pt.2))
DOE-2 reference manual, 5:32444 (LA—7689-M(Ver.2.1)(Pt.1))
DOE-2 users guide: version 2.1, 5:32438 (LBL—8689(Rev.1))
Elastic and inelastic scattering of pions from oxygen-16, 5:32972 (LA—8231-T)
Electromechanical shock in pulse power components, 5:33112 (LA-UR—80-2078)
Environmental and radiological safety studies: interaction of $^{238}PuO_2$ heat sources with terrestrial and aquatic environments. Progress report, January 1-March 31, 1980, 5:32811 (LA—8400-PR)
Evaluation of fast response aerosol mass monitors, 5:32765 (LA—8220)
Fission product release. Progress report, January 1-March 31, 1980, 5:32276 (LA—8389-PR)
FPS camera sync and reset chassis, 5:32757 (LA—8255)
Free electron lasers, 5:32692 (LA-UR—80-2015)
Gamma-ray spectral calculations for uranium borehole logging, 5:31629 (LA—8417-MS)
General-purpose heat source project and space nuclear safety and fuels program. Progress report, March 1980, 5:31724 (LA—8431-PR)
Geohydrology of Bandelier National Monument, New Mexico, 5:32884 (LA—8461-MS)
Global stiffness of hex-can assembly in a uniform force field, 5:32252 (LA—8451-MS)
HYDSES: a subroutine package for using Sesame in hydrodynamic codes, 5:32910 (LA—8209)

Inertial fusion program. Progress report, January 1-June 30, 1978, 5:33118 (LA—7587-PR)
Interregional comparisons of the cost of conserving conventional fuels, 5:32000 (LA-UR—80-1914)
Irradiated fuel inspection in a storage pond with no fuel movement and an uncollimated detector, 5:31668 (LA—8463-MS)
Light-water reactor safety analysis codes, 5:32322 (LA-UR—80-1414)
Location of hydraulic fractures using microseismic techniques, 5:32146 (LA-UR—80-2103)
Los Alamos Scientific Laboratory electronic vehicle identification system, 5:31710 (LA-UR—80-1513)
Magnetotelluric/audiomagnetotelluric study of the Zuni Hot Dry Rock Geothermal Prospect, New Mexico, 5:32093 (LA-UR—80-1486)
MBD diagnostics, 5:33159 (LA—8435-MS)
Medium-energy physics program. Progress report, August 1-October 31, 1979, 5:32714 (LA—8407-PR)
Multi-grid and ICCG for problems with interfaces, 5:33161 (LA-UR—80-2127)
Multivariate statistical analysis of stream sediments for mineral resources from the Craig NTMS Quadrangle, Colorado, 5:31628 (LA—8328-MS)
Overview of the US program for nonconvecting solar ponds, 5:32048 (LA-UR—80-2134)
Passive incentive requirements: a regional assessment, 5:31999 (LA-UR—80-1913)
Performance data for passive systems. The Los Alamos Scientific Laboratory test rooms, 5:32007 (SERI/TR—0924-2)
Physics considerations of the Reversed-Field Pinch fusion reactor, 5:33101 (LA-UR—80-2219)
Plastic deformation in two single crystal clinopyroxenes, 5:32889 (LA—8387-T)
Preparation of carbide-type, advanced LMFBR fuel pellets for irradiation testing, 5:32250 (LA—8304-MS)
Proceedings of the Workshop on Program Options in Intermediate-Energy Physics. Keynote address: New directions in elementary particle physics - pantip from very low to very high energies , 5:32923 (LA—8335-C(Vol.3))
Proceedings of the Workshop on Program Options in Intermediate-Energy Physics. Keynote address: New directions in intermediate-energy nuclear physics , 5:32947 (LA—8335-C(Vol.2))
Radiochemical analyses of samples from beneath a solid radioactive waste disposal pit at Los Alamos, New Mexico, 5:31693 (LA—8422-MS)
Reactor technology. Progress report, January-March 1980, 5:32267 (LA—8403-PR)
Reconnaissance geologic map of the northern Kawich and southern Reveille ranges, Nye County, Nevada, 5:32787 (LA—8390-MAP)
Research and development to support commercialization in solar ponds, 5:32047 (LA-UR—80-2133)
Response of containment vessels to explosive blast loading, 5:32749 (LA—8082)
Selective two-step titration of thorium by sulfate displacement of the diethylenetriaminepentaacetic acid complex, 5:32637 (LA—8349)
Signal enhancement by spectral equalization of high frequency broadband signals transmitted through optical fibers, 5:33074 (LA-UR—80-1830)
Solar coal gasification research. Progress report, April 1-June 30, 1980, 5:31465 (DOE/TIC—11229)
Solar energy research at LASL. Progress report, April 1-September 30, 1979, 5:31998 (LA—8283-PR)
Some laser techniques for chemical detection, 5:32641 (LA-UR—80-2076)
Statistical techniques applied to aerial radiometric surves (STAARS): percentile estimation with the normal and lognormal distributions, 5:31632 (GJBX—123(80))
Study of carbon monoxide production from a multi-hundred watt fuel sphere assembly, 5:31723 (LA—8414-MS)
TRAC posttest calculations of Semiscale Test S-06-3, 5:32321 (LA-UR—80-716)
Transport and reactor theory. Progress report January 1-March 31, 1980, 5:32266 (LA—8380-PR)
Uranium hydrogeochemical and stream sediment reconnaissance of the Shiprock NTMS quadrangle, New Mexico/Arizona, including concentrations of forty-two additional elements, 5:31622 (GJBX—143(80))
Uranium hydrogeochemical and stream sediment reconnaissance of the Casper NTMS Quadrangle, Wyoming, including concentrations of forty-two additional elements, 5:31623 (GJBX—144(80))
Vacuum switchgear for fusion experiments, 5:33111 (LA-UR—80-2072)
Water quality in the vicinity of Fenton Hill, 1979. Progress report, 5:32806 (LA—8424-PR)

Louisiana State Univ., Baton Rouge (USA). Dept. of Petroleum Engineering
Investigations of enhanced oil recovery through use of carbon dioxide. Progress report, July 7, 1978-December 31, 1979, 5:31565 (DOE/MC/03103—2)

Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (USA)
Diesel exhaust emissions toxicology program. Status report, January 1980, 5:32766 (LMF—73)
Fluidized bed combustion emissions toxicology program. Status report, October 1979, 5:32877 (LMF—74)
Respiratory trace deposition models. Final report, 5:32855 (LMF—72)

Lowell Univ., MA (USA). Dept. of Physics and Applied Physics
Neutron scattering studies in thorium and uranium. Progress report, 1 September 1979-30 June 1980, 5:33037 (DOE/ER/10344—2)

Lund Univ. (Sweden)
Energy storage in aquifers: a survey of recent theoretical studies, 5:32338 (LBL—11059)

M

Maine Office of Energy Resources, Augusta (USA)
State of Maine Office of Energy Resources Weekly Price Monitoring System end of survey of report. 2nd annual report to Region I DOE, 5:31582 (DOE/EIA/10157—T1)

Martin Marietta Corp., Denver, CO (USA)
Solar central receiver hybrid power system, Phase I. Volume 2. Conceptual design. Final technical report, October 1978-August 1979, 5:31869 (DOE/ET/21038—1(Vol.2))
Solar central receiver hybrid power system, Phase I. Volume 3. Appendices. Final technical report, October 1978-August 1979, 5:31870 (DOE/ET/21038—1(Vol.3))

Maryland Univ., Baltimore (USA)
Dynamics and consequences of runaway electrons in tokamak plasmas, 5:33090

Maryland Univ., College Park (USA). Dept. of Physics and Astronomy
Non-linear theory of laser-plasma interactions, 5:33083 (DOE/DP/40032—2)

Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)
^{13}C FT-NMR analysis of the isolated by-products of TATB, 5:32754 (MHSMP—80-37)
Compositional analysis technique for HNS/Kel-F 800, 5:32755 (MHSMP—80-39)
HNS aluminum linear shaped charge (ALSC) performance study, 5:32753 (MHSMP—80-36)
Particle velocity of PBX 9404 using the axially symmetric magnetic probe technique, 5:32751 (MHSMP—80-34)
Skid test sensitivity of cast composition B-3 at ambient and low temperatures, 5:32752 (MHSMP—80-35)

Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering
MIT LMFBR Blanket Research Project. Quarterly progress report, January 1-March 31, 1980, 5:32232 (DOE/ET/37241—42)

Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.
Evaluation of health effects of air pollution in the Chestnut Ridge area, 5:32882 (DOE/EV/04968—T1)
Key contributions in MHD power generation. Semi-annual report, December 1, 1978-May 31, 1979, 5:32420 (DOE/ET/15518—1)

Massachusetts Inst. of Tech., Lexington (USA). Lincoln Lab.
Design of solar cells for use in photovoltaic/thermal collectors, 5:31789 (DOE/ET/20279—97)

Massachusetts Inst. of Tech., Oak Ridge, TN (USA). School of Chemical Engineering Practice
Cocurrent three-phase fluidized bed. Part 2, 5:32698 (ORNL-MIT—213)
McMullen (John J.) Associates, Inc., New York (USA)
400 MWe commercial OTEC plants: review of reports by Gibbs and Cox, Inc., Lockheed Missile and Space Corporation, M. Rosenblatt and Sons, 5:31872 (COO—4931-3)
Mechanical Technology, Inc., Latham, NY (USA). Stirling Engine Systems Div.
Automotive Stirling Engine Development Program. Technical progress report for period January 1-March 29, 1980, 5:32515 (DOE/NASA/0032—80/7)
Medearis (Kenneth) and Associates, Fort Collins, CO (USA)
Dynamics of power plant fan-foundation systems. Final report, 5:32194 (EPRI-CS—1440)
Metal Properties Council, Inc., New York (USA)
Program to discover materials suitable for service under hostile conditions obtaining in equipment for the gasification of coal and other solid fuels. Annual progress report, January 1, 1979-December 31, 1979, 5:31467 (FE—1784-60)
Program to discover materials suitable for service under hostile conditions obtaining in equipment for the gasification of coal and other solid fuels. Quarterly progress report, January 1, 1980-March 31, 1980, 5:31468 (FE—1784-63)
Miami Univ., Coral Gables, FL (USA). Dept. of Mechanical Engineering
Characterization and environmental studies of Pompano Beach anaerobic digestion facility. Semi-annual report, 5:32505 (DOE/EV/10133—T1)
Miami Univ., FL (USA). Rosenstiel School of Marine and Atmospheric Sciences
Ecology of subtropical, shallow water environments: chemistry of copper and chlorine introduced into marine systems during energy production. 3 year report, 1 October 1977-30 September 1980, 5:32798 (ORO—3801-11)
Michigan State Univ., East Lansing (USA). Dept. of Botany and Plant Pathology
Investigation on the occurrence and significance of cyclic adenosine 3':5'-monophosphate in phytoplankton and natural aquatic communities, 5:32791 (COO—1599-174)
Investigation on the occurrence and significance of cyclic adenosine 3':5'-monophosphate in phytoplankton and natural aquatic communities, 5:32792 (COO—1599-177(Pt.4))
Phenotypic and genotypic components of growth and reproduction in Typha latifolia: experimental studies in three contrasting marshes, 5:32777 (COO—1599-173)
Michigan State Univ., Hickory Corners (USA). W.K. Kellogg Biological Station
Dissolved organic matter and lake metabolism. Technical progress report, 1 July 1979-30 June 1980, 5:32868 (COO—1599-177(Pt.1))
Michigan Univ., Ann Arbor (USA)
Neutral atom transport in tokamak plasmas by multigroup discrete ordinates methods, 5:33091
Minnesota Energy Agency, St. Paul (USA)
Energy use in Minnesota public buildings: data management and analysis, 5:32461 (ORNL/CON—53)
Minnesota Geological Survey, St. Paul (USA)
Detailed geochemical survey for east-central Minnesota, geology and geochemistry of selected uranium targets, 5:31627 (K/UR—32)
Minnesota Univ., Minneapolis (USA)
Automatic radio telemetry recording of fish temperature and depth, 5:32789 (CONF-790705—2)
Coal gasification: Duluth campus heating plant. Grate support system failure, 5:31460 (DOE/ET/10188—T1)
Observation of quantized circulation in rotating superfluid ^{4}He, 5:32912 (DOE/ER/01569—150)
State of the art and needs of the earth platform, 5:32825 (CONF-7904140—1)
Minnesota Univ., Minneapolis (USA). Cedar Creek Lab.
Use of microprocessor to locate fish in experimental channels, 5:32790 (CONF-790705—3)
Minnesota Univ., Minneapolis (USA). Dept. of Botany
Cattails as an energy source, 5:31852
Minnesota Univ., Minneapolis (USA). Dept. of Physics and Astronomy
Heat capacity of amorphous and disordered Nb_3Ge thin films, 5:33062 (DOE/ER/01569—148)
Minnesota Univ., Minneapolis (USA). School of Physics and Astronomy
Research in theoretical nuclear physics. Progress report and research proposal, 1980-1981, 5:32944 (DOE/ER/10364—13)
Minnick (L.J.), Inc., Plymouth Meeting, PA (USA)
Development of potential uses for the residue from fluidized bed combustion processes. Quarterly technical progress report, March-May 1980, 5:31525 (DOE/ET/10415—T1)
Missouri Univ., Rolla (USA). Dept. of Mathematics
Structural identification, 5:32775 (CONF-800634—2)
Mitre Corp., Bedford, MA (USA)
Resource recovery: research development and demonstration plan, 5:32504 (DOE/CS/20178—01)
Mitre Corp., McLean, VA (USA). METREK Div.
Background material for the workshop on health and environmental effects of coal gasification and liquefaction technologies, 5:31453 (PB—296-708)
Health and environmental effects of coal gasification and liquefaction technologies. A workshop summary and panel reports, 5:31535 (PB—297618)
Self-service fare collection. Volume I. Review and summary, 5:32468 (PB—80-132251)
Mittelhauser Corp., Downers Grove, IL (USA)
Survey of environmental-control technologies for industrial coal use, 5:31529 (ANL/ECT—8)
Mound Facility, Miamisburg, OH (USA)
Consistent spherical potential function for para hydrogen, 5:32903 (MLM—2740(OP))
Method for calibration of plutonium NDA, 5:31711 (MLM—2755(OP))
Radiometric method for the determination of uranium in soil and air: single-laboratory evaluation and interlaboratory collaborative study, 5:32772 (EPA—600/7-80-019)
Mueller Associates, Inc., Baltimore, MD (USA)
Solid fuel applications to transportation engines, 5:32467 (DOE/CS/56051—T2)
Muenchen Univ. (Germany, F.R.). Inst. fuer Anorganische Chemie
New heterogeneous catalysts for coal hydrogenation, 5:31456 (BMFT-FB-T—80-035)

N

National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center
Redox storage systems for solar applications, 5:32429 (DOE/NASA/1002—80-5)
National Center for Appropriate Technology, Butte, MT (USA)
Performance data for passive systems. The National Center for Appropriate Technology, 5:32008 (SERI/TR—0924-3)
National Coal Board, London (UK)
National Coal Board report and accounts, April 1, 1979-March 29, 1980, 5:31545 (NP—25004)
National Inst. for Occupational Safety and Health, Cincinnati, OH (USA). Div. of Surveillance, Hazard Evaluation and Field Studies
Industrial hygiene characterization of the photovoltaic solar cell industry, 5:31788 (DHEW(NIOSH)—80-112)
Naval Civil Engineering Lab., Port Hueneme, CA (USA)
Antifouling marine concrete, 5:31873 (DOE/CH/00134—1)
Naval Research Lab., Washington, DC (USA)
Beam nonuniformity effects on laser ablatively accelerated targets, 5:33120 (NRL-MR—4309)
Electromagnetic instabilities in a focused ion beam propagating through a z-discharge plasma. Interim report, 5:33092 (AD-A—076154)
Generation of high energy-high current ion pulses by magnetic compression of ion rings. Interim report, 5:32713 (AD-A—076200)
Tokamak heating and current maintenance with intense pulsed ion beams, 5:33116 (NRL-MR—4213)
XUV aluminum spectra of laser-produced plasmas, 5:33078 (NRL-Report—8416)
Naval Weapons Center, China Lake, CA (USA)
Economic feasibility study of the geothermal project for the Naval Station, Adak, Alaska. Technical memo, 5:32148 (AD-A—076341)
Neratoom N.V., The Hague (Netherlands)
Bellows for the DEBENE SNR-project, 5:32230 (DOE/CEA/BMFT—14)

Nevada Dept. of Energy, Carson City (USA)
Mid-term report for the State of Nevada. Geothermal Commercialization Planning Project, 5:32103 (DOE/RA/50075—T1)
New Mexico Univ., Albuquerque (USA)
Interregional comparisons of the cost of conserving conventional fuels, 5:32000 (LA-UR—80-1914)
New Mexico Univ., Albuquerque (USA). Dept. of Economics
Passive incentive requirements: a regional assessment, 5:31999 (LA-UR—80-1913)
New Orleans Univ., LA (USA). Dept. of Chemistry
Identification and temporal behavior of radical intermediates formed during the combustion and pyrolysis of gaseous fuels: kinetic pathways to soot formation. Progress report, September 1, 1979-August 31, 1980, 5:32677 (DOE/ER/10505—1)
New York Univ., NY (USA). Courant Inst. of Mathematical Sciences
Similarity solutions of systems of partial differential equations using MACSYMA, 5:33157 (COO—3077-160)
New York Univ., NY (USA). Dept. of Physics
Solvable model for optical and radiative collisions, 5:32906 (AD-A—076102)
Nijverheidsorganisatie TNO, Apeldoorn (Netherlands)
Bellows for the DEBENE SNR-project, 5:32230 (DOE/CEA/BMFT—14)
North Carolina Energy Inst., Research Triangle Park (USA)
Future of alcohol fuels, 5:32418 (NCEI—0015)
North Carolina State Univ., Raleigh (USA)
North Carolina State University nuclear structure research at the Triangle Universities Nuclear Laboratory. Progress report, 1 April 1979-31 March 1980, 5:32943 (DOE/ER/03624—20)
Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979, 5:32945 (DOE/TIC—11133)
North Carolina Univ., Chapel Hill (USA)
Triangle Universities Nuclear Laboratory annual report-TUNL XVIII, 1 January-31 December 1979, 5:32945 (DOE/TIC—11133)

O

Oak Ridge Associated Universities, Inc., TN (USA)
Industrial energy use data book, 5:32476 (ORAU—160)
Oak Ridge Associated Universities, Inc., TN (USA). Inst. for Energy Analysis
Stochastic sun: understanding the intermittent resource, 5:31778 (ORAU/IEA—80-10(M))
Oak Ridge Gaseous Diffusion Plant, TN (USA)
Hydrogeochemical and stream sediment detailed geochemical survey for Lakeview, Oregon, 5:31645 (K/UR—40)
Hydrogeochemical and stream sediment reconnaissance basic data for Rapid City NTMS Quadrangle, South Dakota, 5:31644 (GJBX—159(80))
Noble gas removal system for post-accident decontamination of power reactors, 5:32215 (K/ET—5016)
PLOTLIB: a computerized nuclear waste source-term library storage and retrieval system, 5:31671 (K/OP—248)
Oak Ridge National Lab., TN (USA)
Acute toxicity of selected crude and refined shale oil derived and petroleum-derived substances, 5:32873 (CONF-800680—1)
Analysis of environmental issues related to small scale hydroelectric development. II. Design considerations for passing fish upstream around dams. Environmental Sciences Division Publication No. 1567, 5:31770 (ORNL/TM—7396)
Aspects of the physics, chemistry, and technology of high intensity heavy ion sources, 5:32898 (CONF-800738—1)
Assessment of current research and development in support of the US liquefaction demonstration plants program, 5:31478 (CONF-800806—35)
Automated pattern recognition system for noise analysis, 5:32269 (CONF-800607—42)
Biogeochemistry of mercury in a river-reservoir system: impact of an inactive chloralkali plant on the Holston River-Cherokee Reservoir, Virginia and Tennessee, 5:32807 (ORNL/TM—6141)
Bulk shielding facility. Quarterly report, October-December 1979, 5:32304 (ORNL/TM—7334)
Calculation of neutron and gamma ray energy spectra for fusion reactor shield design: comparison with experiment, 5:33133 (ORNL/TM—7360)
Comparison of the high temperature oxidation behavior of Zircaloy-4 and pure zirconium, 5:32576 (CONF-800834—1)
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Metallographic examination of surveillance coupons from the Wilsonville, Alabama, Solvent Refined Coal Pilot Plant, 1977-1978, 5:31490 (ORNL/TM—7365)
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Structure and chemistry of coals: calorimetric analyses, 5:31519 (CONF-7906177—1)
Systematic study of metal ion sorption on selected geologic media. Annual report, October 1978-December 1979, 5:32782 (DOE/BETC/OR—14)
Oak Ridge Y-12 Plant, TN (USA)
Laser surface finish gauge, 5:32748 (Y/DX—139)
Office of Technology Assessment (U.S. Congress), Washington, DC
Materials and energy from municipal waste, 5:32506 (OTA-M—93)
Ohio State Univ., Columbus (USA)
Cross section and analyzing power in the $^{206}Pb(\rightarrow t,p)\ ^{208}Pb(4^-)$ reaction, 5:33027 (LA-UR—80-1920)
Ohio State Univ. Research Foundation, Columbus (USA)
Kinetics of growth and decay of excited rare gas atoms and molecules in the pulse radiolysis of pure rare gases and of mixtures of rare gases with molecular quenching agents. Technical progress report, 5:32665 (DOE/ER/01116—33)
Ohio Univ., Athens (USA). Dept. of Electrical Engineering
Probabilistic simulation of multiple energy storage devices for production cost calculations. Final report , 5:32197 (EPRI-EA—1411(Vols.1-2))

Optical Coating Lab., Inc., City of Industry, CA (USA). Photoelectronics Div.
Silicon solar cell process development, fabrication and analysis. Sixth quarterly progress report, 1 January-31 March 1980, 5:31807 (DOE/JPL/955089—80/7)
Oregon Inst. of Tech., Klamath Falls (USA). Geo-Heat Utilization Center
Alaska: a guide to geothermal energy development, 5:32066 (DOE/ET/28476—T2)
Geothermal energy in Alaska: site data base and development status, 5:32072 (DOE/ET/28476—T8)
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Oregon: a guide to geothermal energy development, 5:32068 (DOE/ET/28476—T4)
Washington: a guide to geothermal energy development, 5:32067 (DOE/ET/28476—T3)
Washington: a guide to geothermal energy development, 5:32069 (DOE/ET/28476—T5)
Oregon State Univ., Newport (USA). Marine Science Center
Biogeochemical studies of technetium in marine and estuarine ecosystems. Progress report, 1 July 1979-30 June 1980, 5:32814 (DOE/RL/02227—1)

Princeton Energy Group, NJ (USA)
Heating/daylighting prototype development. Phase I, Passive and Hybrid Solar Manufactured Building Project. Interim report and project status report No. 1, 1 October 1979-29 February 1980, 5:31987 (DOE/CS/30367—1)
Princeton Univ., NJ (USA). Plasma Physics Lab.
Current generation by minority species heating, 5:33106 (PPPL—1684)
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Purdue Electric Power Center, Lafayette, IN (USA)
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Purdue Univ., Fort Wayne, IN (USA). Dept. of Chemistry
Solar cell utilizing photochemical generation of electricity. Final research report, 5:31855 (DOE/R5/10114—1)
Purdue Univ., Lafayette, IN (USA). School of Electrical Engineering
Comparison of short term electric power load forecasting methods, 5:32207 (TR-EE—8010)
Forecasting one-step-ahead higher order statistical moments and probability density functions for power system loads using least square estimators, 5:32413 (PCTR—94-80)
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Pennsylvania State Univ., University Park (USA)
Theoretical analysis of carbon cluster formation in solid iron-based alloys: a review of the Alex-McLellan mathematical model, 5:32558 (EPRI-AP—1478)
Pennsylvania State Univ., University Park (USA). Dept. of Architectural Engineering
Evaluation of the solar building, Albuquerque, New Mexico. Final report, April 1974-September 1978, 5:31976 (COO—2704-22)
Pennsylvania Univ., Philadelphia (USA)
Biological production of liquid fuels from biomass. Annual report, September 1, 1978-August 31, 1979, 5:31834 (COO—4070-11)
Pennsylvania Univ., Philadelphia (USA). Dept. of Physics
Large scintillation counter design with waveshifter light collection, 5:32744 (COO—3071-244)
PFR Engineering Systems, Inc., Marina Del Rey, CA (USA)
Solar central receiver reformer system for ammonia plants. Final technical report, 5:32024 (DOE/SF/10735—1)
Solar central receiver reformer system for ammonia plants. Final report, 5:32025 (DOE/SF/10735—1(Exect.Summ.))
Pittsburg and Midway Coal Mining Co., Denver, CO (USA)
Solvent Refined Coal (SRC) process. Research and development report No. 53, interim report No. 29, August-November, 1978. Volume VI. Process development unit studies. Part 1, 5:31479 (DOE/ET/10104—T1)
Pittsburg and Midway Coal Mining Co., Englewood, CO (USA)
Solvent Refined Coal (SRC) process: trace elements. Research and development report No. 53, interim report No. 31, August 1976-July 1977. Volume III. Pilot plant development work. Part 6, 5:31480 (DOE/ET/10104—T2)
Pittsburgh Univ., PA (USA)
Measurement of $\Sigma^- \rightarrow \Lambda$ e-ν and $\Xi^- \rightarrow \Lambda$ e-ν branching ratios, 5:32919
Review of pertinent thermal-hydraulic data for LMFBR core natural circulation analyses, 5:32311 (CONF-800723—19)
Polytechnic Inst. of New York, Farmingdale (USA). Aerodynamics Labs.
Complete burning and extinction of a carbon particle in an oxidizing atmosphere. POLY M/AE report No. 80-16, 5:32678 (DOE/ET/11056—T1)
Powell and Associates, Grand Junction, CO (USA)
Uranium in carbonatites: USA. Final report, 5:31625 (GJBX—147(80))

R

Radian Corp., Austin, TX (USA)
Energy conservation: a route to improved distillation profitability. Executive briefing report, technology transfer, 5:32485 (DOE/CS/4431—T1)
Energy conservation in distillation: a technology applications manual, 5:32486 (DOE/CS/4431—T2)
RAND Corp., Santa Monica, CA (USA)
Quantitative evaluation of closed-cycle Ocean Thermal Energy Conversion (OTEC) technology in central station applications, 5:31876 (RAND/R—2595-E)
Raytheon Service Co., Arlington, VA (USA)
Wind energy systems: program summary, 5:32164 (DOE/CS/20097—01)
Rensselaer Polytechnic Inst., Troy, NY (USA). Center for Electric Power Engineering
Fundamentals of interruption in vacuum. Sixth progress report, 5:32204 (COO—5013-6)
Research Triangle Inst., Research Triangle Park, NC (USA). Applied Ecology Dept.
Support services for commercialization of small hydroelectric facilities in North Carolina, 5:31739 (NCEI—0018)
Resource Engineering, Inc., Cambridge, MA (USA)
Survey of environmental-control technologies for industrial coal use, 5:31529 (ANL/ECT—8)
Rhode Island State Government, Providence (USA)
End of survey report: State of Rhode Island, 5:31581 (DOE/EIA/10160—T1)
Rockwell International Corp., Anaheim, CA (USA). Electronic Devices Div.
Chemical vapor deposition of thin-film polycrystalline Si for low-cost solar cells. Second quarterly technical progress report for period November 3, 1979 through February 1, 1980, 5:31791 (DOE/ET/23045—2)
Thin films of InP for photovoltaic energy conversion. First quarterly technical progress report, July 5, 1979-September 28, 1979, 5:31790 (DOE/ET/23004—T1)
Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group
Cell 18 ion exchange flowsheet, 5:31683 (RHO-F—7)
Deuterium tracer method for investigating the chemistry of coal liquefaction. Quarterly technical progress report, October-December 1979, 5:31484 (FE—2781-5)

Deuterium tracer method for investigating the chemistry of coal liquefaction. Quarterly technical progress report, January-March 1980, 5:31485 (FE—2781-6)
Ion exchange flowsheet for final purification of B plant cesium, 5:31684 (RHO-F—8)
Partial liquefaction of coal by direct hydrogenation. Quarterly progress report, July-September 1979, 5:31482 (FE—2044-49)

Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant
Evaluation of refractory materials for a nuclear waste incinerator, 5:31682 (RFP—2969)
Field radiography using 100 Ci of Co-60 without interrupting adjacent manufacturing operations, 5:32226 (CONF-791008—6)
Literature search for the non-aqueous separation of zinc from fuel rod cladding, 5:31651 (RFP—2979)
Quality engineering and control. Semiannual progress report, November-December 1978, January-April 1979, 5:32632 (RFP—2909)
Quality engineering and control. Semiannual progress report, May-October 1979, 5:32633 (RFP—3015)

Rockwell International Corp., Palo Alto, CA (USA). Energy Systems Group
Molten alkali metal hydroxide catalyzed coal liquefaction. Final report, October 1978-September 1979, 5:31487 (FE—3048-4)
Reference design of 100 MW-h lithium/iron sulfide battery system for utility load leveling, 5:32196 (ANL—80-19)

Rockwell International Corp., Richland, WA (USA). Rockwell Hanford Operations
Basalt Waste Isolation Project. Quarterly report, January 1-March 31, 1980, 5:31698 (RHO-BWI—80-100-2Q)
Decontamination of the 233-S Building Loadout Hood, 5:32670 (RHO-SA—187)
Identification of key radionuclides in a nuclear waste repository in basalt, 5:31699 (RHO-BWI-ST—9)
Inspection and evaluation of Nuclear Fuel Services high-level waste storage system. Program plan, 5:31700 (RHO-CD—882)
Toxic materials availability in perspective, 5:32786 (RHO-SA—97)

Rockwell International Corp., Thousand Oaks, CA (USA). Electronics Research Center
Development of polycrystal GaAs solar cells. Quarterly technical progress report No. 1, January 15-April 30, 1979, 5:31810 (DSE—4042-T3)

Rockwell International Corp., Thousand Oaks, CA (USA). Science Center
Development of high efficiency GaAs polycrystal solar cells. Quarterly technical report No. 1, January 23-April 23, 1978, 5:31819 (SAN—1712-1)
Development of high efficiency GaAs polycrystal solar cells. Quarterly technical and topical report No. 3, July 24-October 23, 1978, 5:31820 (SAN—1712-3)
Development of high efficiency solar cells. Final technical report, January 23, 1978-January 2, 1979, 5:31821 (SAN—1712-T1)

Ross and Baruzzini, Inc., St. Louis, MO (USA)
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Rutgers--the State Univ., New Brunswick, NJ (USA)
Magnetic moment of the lambda hyperon, 5:32916

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Salt River Project, Phoenix, AZ (USA)
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Sandia Labs., Albuquerque, NM (USA)
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Kinetics and mechanisms of the hydroliquefaction of coal: Illinois No. 6, Burning Star Coal in SRC-II heavy distillate, 5:31491 (SAND—80-0232C)
Thermal conductivity of silicic tuffs: predictive formalism and comparison with preliminary experimental results, 5:32890 (SAND—80-0769)

Sandia National Labs., Albuquerque, NM (USA)
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Laboratory testing of percussion drills for geothermal applications, 5:32121 (SAND—80-1351C)
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Light Water Reactor Safety Research and Development Program. Quarterly report, January-June 1979, 5:32325 (SAND—79-2179)
Mechanical energy storage for photovoltaic/wind project. Final report, 5:31864 (SAND—79-2259)
Optimized design and predicted performance of a deep ocean 50 m piston coring system, 5:32711 (SAND—80-0317C)
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Sandis irradiator for dried sewage solids. Final safety analysis report, 5:31722 (SAND—79-2240)
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Sandia National Labs., Livermore, CA (USA)
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Safety analysis report for packaging a DOT 7A specification container for tritiated liquid wastes, 5:32687 (SAND—80-8021)

Schuchart and Associates, Inc., Seattle, WA (USA)
Feasibility study of wood-residue-fired cogeneration at Heppner, Oregon. Final report, 5:32193 (EPRI-AP—1403)

Science Applications, Inc., Ames, IA (USA)
Physics considerations of the Reversed-Field Pinch fusion reactor, 5:33101 (LA-UR—80-2219)

Science Applications, Inc., Golden, CO (USA)
Alternative concepts for supplying carbon dioxide for enhanced oil recovery projects. Final report, 5:31564 (DOE/MC/8333—1)

Science Applications, Inc., McLean, VA (USA)
Comparison of solar heat pump systems to conventional methods for residential heating, cooling, and water heating, 5:32016 (SERI/TR—98150-2(Vol.1)(Exect.Summ.))
Comparison of solar heat pump systems to conventional methods for residental heating, cooling, and water heating. Final report, 5:32015 (SERI/TR—981502(Vol.2))

Comparison of solar heat pump systems to conventional methods for residential heating, cooling, and water heating, 5:32017 (SERI/TR—98150-2(Vol.3)(App.))
Technical-economic assessment of the production of methanol from biomass. Executive summary. Final research report, 5:31840 (DSE—3002-T1(Vol.1))
Technical-economic assessment of the production of methanol from biomass. Conversion process analysis. Final research report, 5:31842 (DSE—3002-T1(Vol.3))
Technical-economic assessment of the production of methanol from biomass. Assessment of biomass resource and methanol market. Final research report, 5:31841 (DSE—3002-T1(Vol.2))

Science Applications, Inc., Monroeville, PA (USA)
Prioritization of tasks in the draft LWR safety technology program plan. Final report, 5:32327 (SAND—80-0686)

Science Applications, Inc., Palo Alto, CA (USA)
Using statistically designed experiments in development of advanced battery systems, 5:32339 (EPRI-EM—1346)

Siltec Corp., Menlo Park, CA (USA)
LSA large area silicon sheet task continuous liquid feed Czochralski growth. Quarterly report, April-June 1980, 5:31805 (DOE/JPL/954886—80/11)
LSA large area silicon sheet task enhanced I.D. slicing. Quarterly report No. 6, April-June 1980, 5:31808 (DOE/JPL/955282—80/6)

Skidaway Inst. of Oceanography, Savannah, GA (USA)
Nearshore transport processes affecting the dilution and fate of energy-related contaminants. Progress report, October 1, 1979-September 30, 1980, 5:32794 (DOE/EV/10331—T1)

Solar Energy Research Inst., Golden, CO (USA)
Biomass gasification: yesterday, today, and tomorrow, 5:31845 (SERI/TP—332-599)
Cadmium sulfide/copper sulfide heterojunction cell research. Quarterly technical progress report, October 1-December 31, 1979, 5:31815 (DSE—4042-T27)
Development of polycrystal GaAs solar cells. Quarterly technical progress report No. 2 for May 1-July 31, 1979, 5:31811 (DSE—4042-T7)
Economic measurement of environment damages, 5:32759 (SERI/RR—744-311)
Feeding value of dried distillers' grains (DDG) in beef feedlot rations. Final report, 5:31846 (SERI/TR—98340-1)
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Solar Environmental Engineering Co., Inc., Fort Collins, CO (USA)
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Solarex Corp., Rockville, MD (USA)
Phase 2 of the array automated assembly task for the Low Cost Silicon Solar Array Project. Seventh quarterly report, 5:31802 (DOE/JPL/954854—80/7)

Southwest Research Inst., San Antonio, TX (USA)
Emergency fuels utilization guidebook. Alternative Fuels Utilization Program, 5:32390 (DOE/CS/54269—01)
Geopressured energy availability. Final report, 5:32076 (EPRI-AP—1457)

Spectrolab, Inc., Sylmar, CA (USA)
Investigation of proposed process sequence for the array automated assembly task: Phase II. Quarterly technical progress report for quarter ending December 29, 1979, 5:31801 (DOE/JPL/954853—79/8)

Sperry Univac, St. Paul, MN (USA)
Solar collector studies for solar heating and cooling applications. Final technical report, 5:32042 (ALO—5355-T2)

Spire Corp., Bedford, MA (USA)
Amorphous silicon solar cells by hydrogen implantation. Quarterly report No. 3, July 1-September 30, 1979, 5:31822 (SAN—3042-3)
Development of silicon recrystallization and thin-film solar cell processes. Third quarterly technical status report, April 1-June 30, 1978, 5:31816 (DSE—4106-T1)

SRI International, Menlo Park, CA (USA)
California energy futures: two alternative societal scenarios and their energy implications, 5:32368 (P—300-80-027)
Comparing California energy options: an application of societal scenarios. Consultant report, 5:32367 (P—300-80-026)
Energy self-sufficiency for the big Island of Hawaii. Final report, 5:32391 (DOE/SF/12076—1)
Energy self-sufficiency for the big Island of Hawaii. Appendices. Final report, 5:32392 (DOE/SF/12076—2)
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Stanford Univ., CA (USA). Dept. of Aeronautics and Astronautics
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Stanford Univ., CA (USA). Inst. for Plasma Research
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Stanford Univ., CA (USA). Stanford Geothermal Program
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State Univ. of New York, Stony Brook (USA). Inst. for Energy Research
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State Univ. of New York, Stony Brook (USA). Marine Sciences Research Center
Lagrangian and Eulerian diffusion study in the coastal surface layers. Progress report, July 1, 1979-June 30, 1980, 5:32793 (DOE/EV/10250—T1)

State Univ. of New York, Stony Brook (USA). Research Foundation
Gene-enzyme telationships in somatic cells and their organismal derivatives in higher plants. Progress report, 5:32826 (DOE/ET/04967—2)

Stein (Richard G.) and Partners, New York (USA)
Handbook of energy use for building construction, 5:32435 (DOE/CS/20220—1)

Stuttgart Univ. (TH) (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme
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Swanson Engineering Associates Corp., McMurray, PA (USA)
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Swanson Service Corp., Huntingdon Beach, CA (USA)
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Swedlow, Inc., Garden Grove, CA (USA)
Development of a 10X lens concentrator. Technical status report, 5:32041 (ALO—4197-T2)

Syracuse Univ., NY (USA). Dept. of Chemical Engineering and Materials Science
Mechanism of gas permeation through polymer membranes. Progress report, June 1, 1979-March 31, 1980, 5:32763 (DOE/ER/05015—2)

Systems Consultants, Inc., Washington, DC (USA)
Regional issue identification and assessment: study methodology. First annual report, 5:32764 (DOE/EV—0063)

Systems Technology, Inc., Paonia, CO (USA)
Mathematical solutions of parametric pulsed production of single phase flow through porous media, 5:31566 (MER—10.1(P-35))

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Tennessee Technological Univ., Cookeville (USA)
Wind effects on collectors. Final report, October 1, 1978-October 1, 1979, 5:32043 (ALO—5364-T1)
Tennessee Univ., Knoxville (USA)
Studies of Elymus mollis directed toward its use in revegation of maritime tundra, 5:32779 (ORO—4180-9)
Summary questionnaire response 7901, october 1979. Progress summary report nov 78-oct 79, 5:32905 (AD A—075951/4)
Tennessee Univ., Memphis (USA). Dept. of Physiology and Biophysics
Studies in iodine metabolism. Progress report and publications, 1979-1980, 5:32865 (DOE/EV/01643—141)
Tennessee Univ., Tullahoma (USA). Space Inst.
Interelectrode insulator development for the UTSI MHD generator. Topical report, 5:32421 (DOE/ET/10815—T1)
Tennessee Valley Authority, Knoxville (USA)
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Role of the planner in comprehensive community energy management, 5:32496 (NP—25000)
Tetra Tech, Inc., Lafayette, CA (USA)
Methodology for evaluation of multiple power-plant-cooling system effect. Volume IV: User's guide to model operation. Final report, 5:32188 (EPRI-EA—1111(Vol.4))
Texaco, Inc., Montebello, CA (USA). Montebello Research Lab.
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The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processses applied to, the subject term.

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	5:32430	SRD—80-055
AC03-78ET12431	Gilbert/Commonwealth, Reading, PA (USA)	
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AC03-78ET12445	United Technologies Corp., South Windsor, CT (USA). Power Systems Div.	
	5:32428	DOE/ET/12445—T1
AC03-78ET13329	TRW Defense and Space Systems Group, Redondo Beach, CA (USA). Engineering Sciences Lab.	
	5:32519	TRW—32512-6002-RU-00
AC03-79CS40208	Beet Sugar Development Foundation, Fort Collins, CO (USA)	
	5:32482	BSDF—38-3Q-80
AC03-79CS40213	Beet Sugar Development Foundation, Fort Collins, CO (USA)	
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AC03-79ET23042	Spire Corp., Bedford, MA (USA)	
	5:31822	SAN—3042-3
AC03-79ET23045	Rockwell International Corp., Anaheim, CA (USA). Electronic Devices Div.	
	5:31791	DOE/ET/23045—2
AC03-79ET27232	WESTEC Services, Inc., San Diego, CA (USA)	
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AC04-76-DP00789	**Sandia National Labs., Albuquerque, NM (USA)**	
	5:32758	SAND—79-1503
AC04-76DP-3533	**Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant**	
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AC04-76D000789	**Sandia National Labs., Albuquerque, NM (USA)**	
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AC04-76DP00053	**Mound Facility, Miamisburg, OH (USA)**	
	5:31711	MLM—2755(OP)
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AC04-76DP00487	**Mason and Hanger-Silas Mason Co., Inc., Amarillo, TX (USA)**	
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AC04-76DP00613	**Bendix Corp., Kansas City, MO (USA)**	
	5:32604	BDX—613-2441
AC04-76DP00656	**General Electric Co., St. Petersburg, FL (USA). Neutron Devices Dept.**	
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AC04-76DP03533	**Rockwell International Corp., Golden, CO (USA). Rocky Flats Plant**	
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AC04-76ET20250	**Baylor Univ., Waco, TX (USA). Baylor Inst. of Environmental Studies**	
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AC04-79CS30171	**Battelle Columbus Labs., OH (USA)**	
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AC04-79CS31072	**Giner, Inc., Waltham, MA (USA)**	
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AC05-76ET12040	**Kentucky Univ., Lexington (USA). Dept. of Geology**	
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AC05-76ET12142	**Illinois State Geological Survey, Urbana (USA)**	
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AC05-76OR00033	**Oak Ridge Associated Universities, Inc., TN (USA). Inst. for Energy Analysis**	
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AC05-77CS05438	**Exxon Research and Engineering Co., Linden, NJ (USA). Government Research Labs.**	
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AC05-77OR05379	**Daedalean Associates, Inc., Woodbine, MD (USA)**	
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AC05-78OR13410	**IIT Research Inst., Chicago, IL (USA)**	
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AC05-79CS56051	**Mueller Associates, Inc., Baltimore, MD (USA)**	
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AC06-77RL01030	**Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group**	
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AC07-79ID01675	**Exxon Nuclear Idaho Co., Inc., Idaho Falls (USA)**	
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AC08-76NV01183	**EG and G, Inc., Goleta, CA (USA). Energy Measurements Group**	
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AC08-77ET28460	**Gruy Federal, Inc., Houston, TX (USA)**	
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AC08-78DP40020	**Honeywell Corporate Material Sciences Center, Bloomington, MN (USA)**	
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AC09-76SR00001	**Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.**	
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AC11-76PN00014	**Bettis Atomic Power Lab., West Mifflin, PA (USA)**	
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AC13-76GJ01664	**Powell and Associates, Grand Junction, CO (USA)**	
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AC19-79BC10027	**Exoil Services, Golden, CO (USA)**	
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AC21-77ET10415	**Minnick (L.J.), Inc., Plymouth Meeting, PA (USA)**	
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AC21-78MC03103	**Louisiana State Univ., Baton Rouge (USA). Dept. of Petroleum Engineering**	
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AC21-78MC08089	**TRW, Inc., McLean, VA (USA). Energy Systems Planning Div.**	
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AC21-80MC14143	**BDM Corp., McLean, VA (USA)**	
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AI01-76CS21002	**National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center**	
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AI01-76CS31024	**Citizens Mutual Savings and Loan Association, Leavenworth, KS (USA)**	
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AI01-76CS31037	**Honeywell, Inc., Minneapolis, MN (USA). Energy Resources Center**	
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AI01-76RA50090	**Johns Hopkins Univ., Laurel, MD (USA). Applied Physics Lab.**	
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AI01-77CS51040	**Mechanical Technology, Inc., Latham, NY (USA). Stirling Engine Systems Div.**	
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AI01-77CS51044	**Eaton Corp., Southfield, MI (USA). Engineering and Research Center**	
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AI01-77DP40042	**Naval Research Lab., Washington, DC (USA)**	
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AI01-77ET13111	**United Technologies Corp., South Windsor, CT (USA). Power Systems Div.**	
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AI01-77ET20002	**Department of Agriculture, New Orleans, LA (USA)**	
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AI01-77RA11025	**Hydrologic Engineering Center, Davis, CA (USA)**	
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AM02-76CH03073	Princeton Univ., NJ (USA). Plasma Physics Lab.	
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AM21-78MC08333	Science Applications, Inc., Golden, CO (USA)	
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AM21-78MC08496	TRW Energy Systems Group, Morgantown, WV (USA)	
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AS01-78ET11070	Alabama Univ., University (USA). Mineral Resources Inst.	
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AS01-78ET13336	Carnegie-Mellon Inst. of Research, Pittsburgh, PA (USA)	
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AS02-76EV01599	Michigan State Univ., East Lansing (USA). Dept. of Botany and Plant Pathology	
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AS02-77CS34519	Colorado State Univ., Fort Collins (USA). Dept. of Mechanical Engineering	
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AS02-77ET29102	Purdue Electric Power Center, Lafayette, IN (USA)	
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AS02-78DP40018	Harvard Univ., Cambridge, MA (USA). Div. of Applied Sciences	
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AS02-78ER04679	Illinois Univ., Urbana (USA). Dept. of Ceramic Engineering	
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AS02-78ER04967	State Univ. of New York, Stony Brook (USA). Research Foundation	
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AS02-78ER05015	Syracuse Univ., NY (USA). Dept. of Chemical Engineering and Materials Science	
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AS02-78ET52048	Wisconsin Univ., Madison (USA). Dept. of Nuclear Engineering	
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AS02-78EV04968	Massachusetts Inst. of Tech., Cambridge (USA). Energy Lab.	
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AS02-79EV10250	State Univ. of New York, Stony Brook (USA). Marine Sciences Research Center	
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AS04-78ET35400	California Univ., Los Angeles (USA). Dept. of Chemical, Nuclear, and Thermal Engineering	
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AS05-76EV01643	Tennessee Univ., Memphis (USA). Dept. of Physiology and Biophysics	
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AS05-76EV03631	Duke Univ., Durham, NC (USA). Dept. of Zoology	
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AS05-76EV03801	Miami Univ., FL (USA). Rosenstiel School of Marine and Atmospheric Sciences	
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AS05-76EV03852	Texas A and M Univ., College Station (USA). Research Foundation	
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AS05-77DP40032	Maryland Univ., College Park (USA). Dept. of Physics and Astronomy	
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AS05-77ER05563	Texas A and M Univ., College Station (USA). Research Foundation	
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AS05-77ET11288	Auburn Univ., AL (USA). Dept. of Mechanical Engineering	
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AS05-78EV10133	Miami Univ., Coral Gables, FL (USA). Dept. of Mechanical Engineering	
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AS05-79ER10505	New Orleans Univ., LA (USA). Dept. of Chemistry	
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CONF-7710234-	(4. international symposium on passivity, Warrenton, VA, USA, 17-21 Oct 1977)	
	5:32580	Princeton, NJ; Electrochemical Society, Inc. (1978).
CONF-7803121-	(Gas conditioning conference, Norman, OK, USA, 6-8 Mar 1978)	
	5:31606	Norman, OK; University of Oklahoma (1978).
CONF-7805135-	(6. mineral waste utilization symposium, Chicago, IL, USA, 2-3 May 1978)	
2	5:32706	AENCO, Inc., 1502 Reybold Ave., New Castle, DE
CONF-781222-	(4. workshop on geothermal reservoir engineering, Stanford, CA, USA, 13-15 Dec 1978)	
	5:32063	*See* SGP-TR-30
	5:32078	*See* SGP-TR-30
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	5:32158	*See* SGP-TR-30
CONF-790204-	(Symposium on waste management and fuel cycles 1979, Tucson, AZ, USA, 28 Feb 1979)	
13	5:32786	*See* RHO-SA-97
CONF-790323-	(Symposium on high spin phenomena in nuclei, Argonne, IL, USA, 15-17 Mar 1979)	
	5:32950	*See* ANL/PHY-79-4
	5:32951	*See* ANL/PHY-79-4
	5:32976	*See* ANL/PHY-79-4
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	5:33045	*See* ANL/PHY-79-4
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	5:33050	*See* ANL/PHY-79-4
CONF-790415-	(177. national meeting of the American Chemical Society, Honolulu, HI, USA, 1-6 Apr 1979)	
P5	5:31650	Washington, DC; American Chemical Society (1980).
CONF-790432-	(Conference on industrial energy conservation technology and exhibition, Houston, TX, USA, 22-25 Apr 1979)	
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(Vol.1)	5:31731	NTIS, PC A23/MF A01
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CONF-7904140-	(13. international symposium on remote sensing of environment, Ann Arbor, MI, USA, 23-27 Apr 1979)	
1	5:32825	NTIS, PC A02/MF A01
CONF-790538-	(Fast ion transport in solids-electrode and electrolytes conference, Lake Geneva, WI, USA, 21-25 May 1979)	
	5:32348	New York, NY; Elsevier North Holland, Inc. (1979).
CONF-790541-	(International Solar Energy Society meeting, Atlanta, GA, USA, 28 May 1979)	
63	5:31853	NTIS, PC A02/MF A01
CONF-7905135-	(Conference on the role of organic soil in the world carbon cycle, Indianapolis, IN, USA, 7-8 May 1979)	
	5:32776	NTIS, PC A03/MF A01
CONF-7905174-	(Conference on small-scale hydropower in the Mid-Atlantic states, Washington, DC, USA, 4-5 May 1979)	
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CONF-7906104-	(Wastewater workshop, Germantown, MD, USA, 14-15 Jun 1979)	
	5:31527	*See* DOE/EV-0081
CONF-7906177-	(54. colloid and surface science symposium, Bethlehem, PA, USA, Jun 1979)	
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CONF-790705-	(International conference on wildlife biotelemetry, Laramie, WY, USA, 30 Jul-1 Aug 1979)	
2	5:32789	NTIS, PC A02/MF A01
3	5:32790	NTIS, PC A02/MF A01
CONF-790787-	(Workshop on beam current limitations in storage rings, Upton, NY, USA, 16-27 Jul 1979)	
1	5:32715	*See* BNL-27973
CONF-790851-	(8. international conference on amorphous and liquid semiconductors, Cambridge, MA, USA, 27-31 Aug 1979)	
(Pt.1)	5:32521	Amsterdam, NE; North-Holland Publishing Co. (1980).
(Pt.1)	5:32534	35 & 36: 159-170(1980)
(Pt.1)	5:32535	35 & 36: 213-218(1980)
(Pt.1)	5:32536	35 & 36: 243-248(1980)
(Pt.1)	5:32537	35 & 36: 285-290(1980)
(Pt.1)	5:32538	35 & 36: 531-536(1980)
(Pt.1)	5:32539	35 & 36: 543-548(1980)
(Pt.1)	5:32568	35 & 36: 61-66(1980)
(Pt.1)	5:32569	35 & 36: 273-277(1980)
(Pt.1)	5:32570	35 & 36: 279-284(1980)
(Pt.1)	5:32571	35 & 36: 381-386(1980)
(Pt.1)	5:32572	35 & 36: 387-390(1980)
(Pt.1)	5:32573	35 & 36: 459-462(1980)
(Pt.1)	5:32574	35 & 36: 605-610(1980)
CONF-7908121-	(Workshop on program options in intermediate-energy physics, Los Alamos, NM, USA, 20-31 Aug 1979)	
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CONF-790906-	(Geothermal Resources Council annual meeting, Reno, NV, USA, 24 Sep 1979)	
33	5:32113	*See* LBL-9808
CONF-790928-	(International meeting on monitoring of Pu-contaminated waste, Ispra, Italy, 25-28 Sep 1979)	
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CONF-7909141-	(Gulf of Mexico coastal ecosystems workshop, Port Aransas, TX, USA, 4-7 Sep 1979)	
	5:32795	*See* FWS/OBS-80/30
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	5:32797	*See* FWS/OBS-80/30
	5:32805	*See* FWS/OBS-80/30
	5:32818	*See* FWS/OBS-80/30
	5:32819	*See* FWS/OBS-80/30
CONF-7909152-	(5. joint US/USSR conference of the microbial enzyme reactions project of the US/USSR joint working group on the production of substances by microbiological means, Riga, USSR, 30 Sep-5 Oct 1979)	
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CONF-791090-	(Symposium on potential environmental and health effects of atmospheric sulfur deposition, Gatlinburg, TN, USA, 14-18 Oct 1979)	
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9	5:32768	*See* PNL-SA-8009
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CONF-7910166-	(2. symposium on the Cerro Prieto Geothermal Field, Baja California, Mexico, 17-19 Oct 1979)	
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CONF-791168-	(IAEA specialists' meeting on bellows for sodium systems, Tokyo, Japan, 5-9 Nov 1979)	
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CONF-791233-	(Conference on thermal performance of the exterior envelopes of buildings, Orlando, FL, USA, 3-5 Dec 1979)	
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CONF-791234-	(Environmental decontamination workshop, Oak Ridge, TN, USA, 4-5 Dec 1979)	
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CONF-791239-	(3. solar heating and cooling demonstration program contractors review meeting, Norfolk, VA, USA, 16-19 Dec 1979)	

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	5:31938	NTIS, PC A99/MF A01
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	5:31945	NTIS, PC A99/MF A01
	5:31946	NTIS, PC A99/MF A01
	5:31947	NTIS, PC A99/MF A01
	5:31948	NTIS, PC A99/MF A01
	5:31949	NTIS, PC A99/MF A01
	5:31950	NTIS, PC A99/MF A01
	5:31951	NTIS, PC A99/MF A01
	5:31952	NTIS, PC A99/MF A01
	5:31953	NTIS, PC A99/MF A01
	5:31954	NTIS, PC A99/MF A01
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	5:31960	NTIS, PC A99/MF A01
	5:31961	NTIS, PC A99/MF A01
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	5:31963	NTIS, PC A99/MF A01
	5:31964	NTIS, PC A99/MF A01
	5:31965	NTIS, PC A99/MF A01
	5:31966	NTIS, PC A99/MF A01
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	5:31969	NTIS, PC A99/MF A01
	5:31970	NTIS, PC A99/MF A01
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	5:31972	NTIS, PC A99/MF A01
	5:31973	NTIS, PC A99/MF A01
	5:31974	NTIS, PC A99/MF A01
	5:31975	NTIS, PC A99/MF A01
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	5:32028	NTIS, PC A99/MF A01
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	5:32031	NTIS, PC A99/MF A01
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	5:32033	NTIS, PC A99/MF A01
	5:32034	NTIS, PC A99/MF A01
	5:32035	NTIS, PC A99/MF A01
	5:32036	NTIS, PC A99/MF A01
CONF-800111-		(Annual conference of the American Association for the Advancement of Science, San Francisco, CA, USA, 4 Jan 1980)
3	5:32837	*See* SLAC-PUB-2462
5	5:32389	*See* LBL-11219
CONF-800141-		(International congress for study of semi-arid and arid zones, La Serena, Chile, Jan 1980)
1	5:31829	NTIS, PC A02/MF A01
CONF-800142-		(Institute of gas technology symposium, Orlando, FL, USA, Jan 1980)
1	5:31852	St.Paul, MN; Univ. of Minnesota (1979).
CONF-800243-		(Wire chamber conference, Vienna, Austria, 27-29 Feb 1980)
2	5:32737	*See* BNL-28160
CONF-800246-		(Forest Products Research Society: Energy from forest products, Atlanta, GA, USA, Feb 1980)
1	5:31845	*See* SERI/TP-332-599
CONF-800248-		(American Nuclear Society conference, Las Vegas, NV, USA, 3-8 Feb 1980)
1	5:32298	*See* HEDL-SA-2028
CONF-800249-		(Energy demand forecasting peer review workshop, Sacramento, CA, USA, 28-29 Feb 1980)
(Absts.)	5:32410	*See* P-300-80-023
CONF-800303-		(179. national meeting of the American Chemical Society, Houston, TX, USA, 23-28 Mar 1980)
P4	5:31457	25: No. 1, 277-285(1979)
P4	5:31493	University Microfilms International, Ann Arbor, MI, $8.00
P4	5:31494	25: No. 1, 10-15(1979)
P4	5:31495	25: No. 1, 18-24(1979)
P4	5:31496	25: No. 1, 25-36(1979)
P4	5:31497	25: No. 1, 37-46(1979)
P4	5:31498	25: No. 1, 47-52(1979)
P4	5:31499	25: No. 1, 53-65(1979)
P4	5:31500	25: No. 1, 66-77(1979)
P4	5:31501	25: No. 1, 79-83(1979)
P4	5:31502	25: No. 1, 84-148(1979)
P4	5:31503	25: No. 1, 152-163(1979)
P4	5:31504	25: No. 1, 164-175(1979)
P4	5:31505	25: No. 1, 176-187(1979)
P4	5:31506	25: No. 1, 233-244(1979)
P4	5:31507	25: No. 1, 245-255(1979)
P4	5:31508	25: No. 1, 264-272(1979)
P4	5:31511	25: No. 1, 188-198(1979)
P4	5:31513	25: No. 1, 256-263(1979)
P4	5:31522	25: No. 1, 210-218(1979)
P4	5:31523	25: No. 1, 219-223(1979)
P4	5:31539	25: No. 1, 199-209(1979)
P4	5:31547	25: No. 1, 224-232(1979)
CONF-800315-		(2. symposium of the European Safeguards Research and Development Association, Edinburgh, UK, 26 Mar 1980)
21	5:31709	NTIS, PC A02/MF A01
CONF-800334-		(2. DOE environmental control symposium, Reston, VA, USA, 17-19 Mar 1980)
15	5:32245	*See* HEDL-SA-1988
18	5:31530	NTIS, PC A02/MF A01
19	5:31830	NTIS, PC A02/MF A01
21	5:32871	*See* PNL-SA-8439

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CONF-800380-		(3. international trade exhibition and congress for oil, gas, chemical and process engineering industries, Bombay, India, 16-23 Mar 1980)
	5:32374	NTIS (US Sales Only), PC A04/MF A01
	5:32375	NTIS (US Sales Only), PC A04/MF A01
	5:32376	NTIS (US Sales Only), PC A04/MF A01
	5:32377	NTIS (US Sales Only), PC A04/MF A01
	5:32384	NTIS (US Sales Only), PC A04/MF A01
	5:32388	NTIS (US Sales Only), PC A04/MF A01
	5:32398	NTIS (US Sales Only), PC A04/MF A01
	5:32401	NTIS (US Sales Only), PC A04/MF A01
	5:32630	NTIS (US Sales Only), PC A04/MF A01
CONF-800392-		(Public meeting on federal research into biological effects of ionizing radiation, Bethesda, MD, USA, 10-11 Mar 1980)
1	5:32863	NTIS, PC A02/MF A01
CONF-800395-		(Consultants meeting on neutron source properties, Degrecen, Hungary, 17-21 Mar 1980)
1	5:32720	*See* ANL/NDM-53
CONF-800401-		(2. international conference of liquid metal technology for energy systems, Richland, WA, USA, 20-24 Apr 1980)
16	5:32291	*See* HEDL-SA-1874-FP
17	5:32242	*See* HEDL-SA-1897-FP
18	5:32293	*See* HEDL-SA-1893-FP
19	5:32239	*See* HEDL-SA-1871-FP
20	5:32238	*See* HEDL-SA-1870
21	5:32244	*See* HEDL-SA-1954
24	5:32320	*See* HEDL-SA-2131-FP
25	5:32300	*See* HEDL-SA-2083
26	5:32241	*See* HEDL-SA-1886-FP
27	5:32302	*See* HEDL-SA-2107-F
CONF-800427-		(Tritium technology in fission, fusion, and isotopic applications, Dayton, OH, USA, 29 Apr-1 May 1980)
17	5:32240	*See* HEDL-SA-1875-FP
CONF-800434-		(CSNI specialist meeting on nuclear aerosols in reactor safety, Gatlinburg, TN, USA, 15-17 Apr 1980)
4	5:32328	*See* SAND-80-1112C
6	5:32316	*See* HEDL-SA-1981-FP
7	5:32317	*See* HEDL-SA-1982-FP
8	5:32319	*See* HEDL-SA-2017-FP
CONF-800482-		(Bio-energy world congress and exposition, Atlanta, GA, USA, 21-24 Apr 1980)
4	5:31851	NSTL Station, MS; National Space Technology Labs. (1980).
CONF-800484-		(Reversed field pinch theory workshop, Los Alamos, NM, USA, 28 Apr-2 May 1980)
3	5:33084	*See* LA-UR-80-2220
4	5:33101	*See* LA-UR-80-2219
CONF-800497-		(Workshop on numerical integration of ordinary differential equations, Bielefeld, F.R. Germany, 14-23 Apr 1980)
1	5:33163	*See* SAND-80-0417C
CONF-800499-		(International workshop on gamma-gamma collisions, Amiens, France, 8-12 Apr 1980)
1	5:32727	*See* SLAC-PUB-2521
CONF-8004104-		(Symposium on toxic substance control decontamination, Columbus, OH, USA, 22-24 Apr 1980)
1	5:32641	*See* LA-UR-80-2076
CONF-800525-		(SPE/DOE symposium on unconventional gas recovery, Pittsburgh, PA, USA, 18-21 May 1980)
	5:31588	Society of Petroleum Engineers
CONF-800526-		(Alcohol alternative conference, Chicago, IL, USA, 1-2 May 1980)
2	5:32419	Houma, LA; Sugarcane Field Laboratory (1980).
CONF-800531-		(Industrial hygiene conference, Houston, TX, USA, 18-23 May 1980)
2	5:32294	*See* HEDL-SA-1957-FP
CONF-800555-		(International conference on lasers, Shanghai, China, 3-15 May 1980)
2	5:32692	*See* LA-UR-80-2015
CONF-800592-		(International conference on postirradiation examination, The Lake District, UK, 13-15 May 1980)
1	5:32292	*See* HEDL-SA-1878-FP
CONF-800598-		(Progress review conference on district heating, Detroit, MI, USA, 29-30 May 1980)
	5:32501	NTIS, PC A10/MF A01
CONF-800599-		(35. annual Purdue industrial waste conference, West Lafayette, IN, USA, 13-15 May 1980)
1	5:32870	NTIS, PC A02/MF A01
CONF-8005104-		(International conference on superconducting quantum interference devices, Berlin, F.R. Germany, 5-9 May 1980)
2	5:32888	*See* LBL-11115
CONF-8005105-		(35. annual technical conference, San Francisco, CA, USA, 11-13 May 1980)
1	5:31705	*See* SAND-80-0531C
CONF-800602-		(Symposium on instrumentation and control for fossil energy processes, Virginia Beach, VA, USA, 9-11 Jun 1980)
8	5:31531	NTIS, PC A02/MF A01
CONF-800604-		(American section of the International Solar Energy Society conference, Phoenix, AZ, USA, 2-6 Jun 1980)
33	5:32002	*See* LBL-10033
34(Rev.)	5:32001	*See* LBL-9292(Rev.)
35	5:31867	*See* SAND-79-2154C
CONF-800607-		(American Nuclear Society annual meeting, Las Vegas, NV, USA, 8-13 Jun 1980)
40	5:32264	NTIS, PC A02/MF A01
42	5:32269	NTIS, PC A02/MF A01
59	5:32265	NTIS, PC A02/MF A01
62	5:32296	*See* HEDL-SA-2007
63	5:32283	*See* HEDL-SA-1995-FP
68	5:32303	*See* HEDL-SA-2163
69	5:32248	*See* HEDL-SA-2126-S-FP
70	5:32247	*See* HEDL-SA-2050-FP
73	5:32295	*See* HEDL-SA-1999
74	5:32318	*See* HEDL-SA-2012-FP
76	5:32297	*See* HEDL-SA-2024-FP
77	5:32299	*See* HEDL-SA-2040-FP
81	5:32246	*See* HEDL-SA-2049-FP
82	5:32301	*See* HEDL-SA-2088-FP
CONF-800610-		(American Institute of Chemical Engineering conference, Philadelphia, PA, USA, 8-12 Jun 1980)
9	5:31459	NTIS, PC A02/MF A01
CONF-800634-		(International conference on nonlinear phenomena in mathematical sciences, Arlington, TX, USA, 16-20 Jun 1980)
2	5:32775	NTIS, PC A02/MF A01
CONF-800635-		(Conference of the American Society of Heating, Refrigeration and Air Conditioning Engineers, Denver, CO, USA, 22-26 Jun 1980)
2	5:31785	*See* SERI/TP-733-698
4	5:32453	Chicago, IL; Institute of Gas Technology (1980).
CONF-800640-		(14. pulse power modulator symposium, Orlando, FL, USA, 3-5 Jun 1980)
17	5:33112	*See* LA-UR-80-2078
CONF-800641-		(International conference on the metallurgical effects of high strain rate deformation and fabrication, Albuquerque, NM, USA, 22-26 Jun 1980)
6	5:32551	*See* SAND-80-1300C
CONF-800642-		(International gas research conference, Chicago, IL, USA, 9-12 Jun 1980)
4	5:32448	NTIS, PC A02/MF A01
CONF-800648-		(GCFRP program technical review meeting, San Diego, CA, USA, 4-6 Jun 1980)
2	5:32237	*See* GA-A-15922
3	5:32282	*See* GA-A-15891
4	5:32234	*See* GA-A-15851
5	5:32236	*See* GA-A-15918
6	5:32235	*See* GA-A-15906
CONF-800655-		(21. annual meeting of the Institute of Nuclear Materials Management, Palm Beach, FL, USA, 30 Jun-2 Jul 1980)
31	5:31713	*See* SAND-80-1919C

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CONF-800667-	(2. international conference on liquid metal technology in energy production, Richland, WA, USA, 21 Jun 1980)	
1	5:32243	*See* HEDL-SA-1941
CONF-800673-	(13. national symposium on fracture mechanics, Philadelphia, PA, USA, 8-13 Jun 1980)	
2	5:32548	*See* HEDL-SA-2101-FP
CONF-800680-	(Symposium on health effects investigations of oil shale development, Gatlinburg, TN, USA, 23-24 Jun 1980)	
1	5:32873	NTIS, PC A03/MF A01
CONF-800681-	(EPRI geothermal workshop, Monterey, CA, USA, 23-27 Jun 1980)	
1	5:32110	NTIS, PC A02/MF A01
CONF-800684-	(International conference on experimentation at LEP, Uppsala, Sweden, 16-20 Jun 1980)	
3	5:32744	*See* COO-3071-244
CONF-800690-	(10. steenback symposium, Madison, WI, USA, 8-12 Jun 1980)	
1	5:32850	*See* BNL-28008
CONF-800692-	(2. annual energy quality assurance conference, Idaho Falls, ID, USA, 25-26 Jun 1980)	
1	5:32478	NTIS, PC A02/MF A01
CONF-800693-	(28. conference on remote systems technology, Las Vegas, NV, USA, 8-13 Jun 1980)	
1	5:32729	*See* LA-UR-80-1358
CONF-800694-	(Sitges international school and symposium on statistical mechanics, Sitges, Spain, 9-13 Jun 1980)	
1	5:32911	*See* UCRL-84455
CONF-800696-	(International conference on dislocation modeling of physical systems, Gainesville, FL, USA, 22-27 Jun 1980)	
1	5:32582	*See* HEDL-SA-2078
CONF-800697-	(Western Economic Association annual meeting, San Diego, CA, USA, Jun 1980)	
1	5:32000	*See* LA-UR-80-1914
CONF-800699-	(Elliptic problem solvers conference, Santa Fe, NM, USA, 30 Jun-2 Jul 1980)	
1	5:33155	*See* BNL-28138
CONF-8006102-	(Rockstore 80 conference, Stockholm, Sweden, 23-29 Jun 1980)	
1	5:32338	*See* LBL-11059
CONF-8006108-	(11. international symposium on multiparticle dynamics, Bruges, Belgium, 22-27 Jun 1980)	
1	5:32998	*See* BNL-28166
CONF-800703-	(Annual conference on nuclear and space radiation effects, Ithaca, NY, USA, 15-18 Jul 1980)	
5	5:32730	*See* SAND-80-0637C
CONF-800715-	(12. international symposium on rarefied gas dynamics, Charlottesville, VA, USA, 7-11 Jul 1980)	
2	5:32593	*See* SAND-80-0298C
CONF-800719-	(International symposium of the Society of Photo-Optical Instrumentation Engineers, San Diego, CA, USA, 28 Jul-1 Aug 1980)	
3	5:32748	*See* Y/DX-139
4	5:32286	NTIS, PC A02/MF A01
5	5:32287	NTIS, PC A02/MF A01
7	5:33165	*See* UCRL-84658
10	5:33119	*See* LA-UR-80-1885
CONF-800723-	(19. national heat transfer conference, Orlando, FL, USA, 27-30 Jul 1980)	
2	5:32310	NTIS, PC A02/MF A01
3	5:32321	*See* LA-UR-80-716
19	5:32311	NTIS, PC A03/MF A01
22	5:32003	*See* LBL-10257
CONF-800724-	(20. international conference on high energy physics, Madison, WI, USA, 17-23 Jul 1980)	
6	5:32928	*See* BNL-27950
10	5:32736	*See* BNL-28117
11	5:32917	*See* BNL-28119
13	5:32935	*See* LA-UR-80-2450
CONF-800733-	(Conference on sparse matrices and their uses, Reading, UK, 9-11 Jul 1980)	
1	5:33156	NTIS, PC A02/MF A01
CONF-800738-	(3. international conference on ion implantation: equipment and technique, Kingston, Ontario, Canada, 8-11 Jul 1980)	
1	5:32898	NTIS, PC A05/MF A01
CONF-800739-	(6. international fermentation symposium and 5. international symposium on yeasts, London, Ontario, Canada, 20-25 Jul 1980)	
1	5:31561	NTIS, PC A02/MF A01
CONF-800740-	(11. international conference on high energy accelerators, Geneva, Switzerland, 7-11 Jul 1980)	
2	5:32717	*See* BNL-28034
3	5:32722	*See* BNL-28013
4	5:32716	*See* BNL-28020
5	5:32721	*See* BNL-28004
10	5:32718	*See* SLAC-PUB-2537
11	5:32724	*See* SLAC-PUB-2522
CONF-800741-	(27. sagamore army materials research conference, Bolton Landing, NY, USA, 14-18 Jul 1980)	
1	5:32544	NTIS, PC A02/MF A01
CONF-800743-	(International conference on nuclear waste transmutation, Austin, TX, USA, 22-24 Jul 1980)	
7	5:31718	*See* BNL-28067
CONF-800744-	(Ion beam modification of materials conference, Albany, NY, USA, 14-18 Jul 1980)	
3	5:32550	*See* SAND-80-0779C
CONF-800748-	(Purdue compressor technology conference, West Lafayette, IN, USA, 23-25 Jul 1980)	
1	5:31879	*See* BNL-27962
CONF-800751-	(Workshop on thermomechanical-hydrochemical modeling for hardrock waste repository, Bereley, CA, USA, 29-31 Jul 1980)	
2	5:31706	*See* UCRL-84643
CONF-800753-	(US DOE transuranic waste management program decontamination technology transfer meeting, Richalnd, WA, USA, 29-30 Jul 1980)	
1	5:32670	*See* RHO-SA-187
CONF-800754-	(International symposium on the ruminant immune system, Plymouth, NH, USA, 7-10 Jul 1980)	
1	5:32827	*See* LA-UR-80-1904
CONF-800756-	(Elliptic equation conference, Santa Fe, NM, USA, Jul 1980)	
1	5:33161	*See* LA-UR-80-2127
CONF-800757-	(Nonconvecting solar pond workshop, Washington, DC, USA, 30-31 Jul 1980)	
1	5:32047	*See* LA-UR-80-2133
2	5:32048	*See* LA-UR-80-2134
CONF-800758-	(Toxicology forum on safety assessment for specific compounds, Aspen, CO, USA, 27 Jul-1 Aug 1980)	
1(Draft)	5:32874	NTIS, PC A02/MF A01
CONF-800759-	(Energy in the third world conference, Vienna, Austria, 28-30 Jul 1980)	
1	5:31537	NTIS, PC A03/MF A01
CONF-800761-	(Energy farms workshop of California Energy Commission, Sacramento, CA, USA, 14 Jul 1980)	
1	5:31831	NTIS, PC A02/MF A01
CONF-800801-	(Annual meeting of the Electron Microscopy Society of America and 15. Microbeam Analysis Society Conference, San Francisco, CA, USA, 4-8 Aug 1980)	
8	5:33057	NTIS, PC A02/MF A01
CONF-800802-	(89. annual meeting of the American Institute of Chemical Engineers, Portland, OR, USA, 17-20 Aug 1980)	
8	5:32215	*See* K/ET-5016
CONF-800804-	(ASME century 2 emerging technology conference, San Francisco, CA, USA, 10-22 Aug 1980)	
2	5:32227	NTIS, PC A03/MF A01
4	5:32288	NTIS, PC A02/MF A01
8	5:32228	NTIS, PC A03/MF A01
11	5:32217	*See* UCRL-82217
CONF-800806-	(15. intersociety energy conversion engineering conference, Seattle, WA, USA, 18-22 Aug 1980)	
14	5:32262	*See* GA-A-15837
32	5:32431	*See* BNL-28094
33	5:32337	*See* LBL-10889
34	5:32117	*See* LBL-11025
35	5:31478	NTIS, PC A02/MF A01
36	5:32115	NTIS, PC A02/MF A01

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CONF-800809-		(18. combustion symposium, Waterloo, Canada, 17-22 Aug 1980)
5	5:32680	*See* LBL-10784
CONF-800814-		(180. American Chemical Society meeting/2. chemical congress of the North American Continent, Las Vegas, NV, USA, 24-29 Aug 1980)
6	5:32677	*See* DOE/ER/10505-1
8	5:32673	*See* DP-MS-79-109
CONF-800820-		(American Statistical Society meeting, Houston, TX, USA, 11-14 Aug 1980)
2	5:32326	*See* SAND-80-0373C
7(Draft)	5:31619	NTIS, PC A02/MF A01
CONF-800824-		(5. international symposium on polarization phenomena in nuclear physics, Santa Fe, NM, USA, 11-15 Aug 1980)
12	5:33027	*See* LA-UR-80-1920
CONF-800828-		(Solwest, Vancouver, British Columbia, Canada, 6-10 Aug 1980)
2	5:31999	*See* LA-UR-80-1913
CONF-800830-		(14. international conference on thermodynamics and statistical mechanics, Edmonton, Alberta, Canada, 17-23 Aug 1980)
1	5:32903	*See* MLM-2740(OP)
CONF-800832-		(Annual meeting of the American Society of physiologists, Pullman, WA, USA, Aug 1980)
1	5:32872	*See* BNL-28091
CONF-800833-		(13. annual technical meeting of the International Metallographic Society, Brighton, UK, 18-20 Aug 1980)
1	5:32552	*See* UCRL-83986
2	5:32546	*See* DP-MS-80-19
CONF-800834-		(5. international conference on zirconium in the nuclear industry, Boston, MA, USA, 4-7 Aug 1980)
1	5:32576	NTIS, PC A03/MF A01
CONF-800835-		(Symposium on energy modeling III: dealing with energy uncertainty, Chicago, IL, USA, 4-8 Aug 1980)
1	5:32365	NTIS, PC A02/MF A01
CONF-800836-		(52. NTA annual convention, Chicago, IL, USA, 12-16 Aug 1980)
1	5:32693	*See* UCRL-84763
CONF-800838-		(International fluidization conference, Henniker, NH, USA, 3-8 Aug 1980)
1	5:31550	NTIS, PC A02/MF A01
CONF-800839-		(NATO advanced study institute superconducting materials-science and technology, Lisbon, Portugal, 19-29 Aug 1980)
1	5:32522	*See* BNL-28150
CONF-800840-		(Symposium on the economic development of desert plants, Tucson, AZ, USA, 4 Aug 1980)
1	5:31832	NTIS, PC A02/MF A01
CONF-800901-		(Symposium on intermediate range atmospheric transport processes and technology assessment, Gatlinburg, TN, USA, 29 Sep-2 Oct 1980)
4	5:31649	*See* DP-MS-80-22
CONF-800902-		(9. international symposium on the reactivity of solids, Cracow, Poland, 1-6 Sep 1980)
1	5:32589	*See* LBL-10392
CONF-800903-		(6. international conference on high voltage microscopy, Antwerp, Belgium, 1-3 Sep 1980)
1	5:32650	*See* LBL-10729
2	5:32702	*See* GEPP-OP-476
CONF-800905-		(Photoelectrochemistry conference, Oxford, UK, 8-10 Sep 1980)
1	5:32661	*See* DOE/ER/01198-1306
2	5:31858	*See* LBL-11168
CONF-800906-		(National ACS meeting on chemistry of asphaltenes, Washington, DC, USA, Sep 1980)
1	5:31572	*See* LA-UR-80-1439
CONF-800907-		(Aspects of creep conference, Sheffield, UK, Sep 1980)
1	5:32683	*See* UCRL-82233
CONF-800909-		(Nuclear reactor safety heat transfer international seminar, Dubrovnik, Yugoslavia, 1-5 Sep 1980)
1	5:32312	NTIS, PC A03/MF A01
2	5:32329	*See* UCRL-84151
CONF-800910-		(5. international conference on coal research, Dusseldorf, F.R. Germany, 1-5 Sep 1980)
1	5:31546	*See* IS-M-275
CONF-800911-		(1. European signal processing conference, Lausanne, Switzerland, 16-19 Sep 1980)
1	5:32699	*See* LA-UR-80-1277
CONF-800913-		(International conference: security through science and engineering, Berlin, F.R. Germany, 23-26 Sep 1980)
1	5:31710	*See* LA-UR-80-1513
CONF-800914-		(IEEE meeting, Cincinnati, OH, USA, 29 Sep 1980)
1	5:31677	*See* DP-MS-79-108
CONF-800917-		(12. power sources conference, Brighton, UK, 15-18 Sep 1980)
1	5:32429	*See* DOE/NASA/1002-80-5
2	5:32345	*See* SAND-79-2156C
CONF-800918-		(International solvent extraction conference, Liege, Belgium, 6-12 Sep 1980)
1	5:32644	*See* IS-M-281
CONF-800919-		(7. world conference on earthquake engineering, Istanbul, Turkey, 8-13 Sep 1980)
2	5:32216	*See* LBL-10351
3	5:32747	*See* LBL-10386
4(Rev.1)	5:32285	*See* UCRL-82234(Rev.1)
CONF-800920-		(Geothermal Resource Council annual meeting, Salt Lake City, UT, USA, 9-11 Sep 1980)
1	5:32093	*See* LA-UR-80-1486
8	5:32111	NTIS, PC A02/MF A01
9	5:32112	NTIS, PC A02/MF A01
12	5:32121	*See* SAND-80-1351C
13	5:32145	*See* UCRL-84461
24	5:32099	*See* LA-UR-80-1903
25	5:32114	*See* LBL-10974
CONF-800921-		(IEEE/Oceans '80 conference, Seattle, WA, USA, 8-10 Sep 1980)
1	5:31703	*See* SAND-80-0304C
2	5:32711	*See* SAND-80-0317C
CONF-800922-		(6. international conference on gas discharges and their applications, Edinburgh, UK, 8-11 Sep 1980)
1	5:32743	NTIS, PC A02/MF A01
CONF-800923-		(9. international symposium on discharges and electrical insulations in vacuum, Eindhoven, Netherlands, 16-19 Sep 1980)
1	5:32701	*See* GEPP-OP-473
3	5:33122	*See* SAND-80-1358C
CONF-800924-		(Fiber optics conference, San Francisco, CA, USA, Sep 1980)
1	5:33074	*See* LA-UR-80-1830
CONF-800925-		(1. Chautauqua on finite element modeling and MSC/nastran, Cape Cod, MA, USA, 15-17 Sep 1980)
1	5:32052	*See* SAND-80-0381C
CONF-800927-		(7. annual national energy division conference, Houston, TX, USA, 29-31 Sep 1980)
1	5:32229	NTIS, PC A02/MF A01
CONF-800928-		(8. international vacuum congress/ 4. international conference on surface science and 3. European conference on solid surface, Cannes, France, 22-26 Sep 1980)
2	5:32682	*See* SLAC-PUB-2528
3	5:32725	*See* SLAC-PUB-2533
CONF-800929-		(American Chemical Society fall meeting, San Francisco, CA, USA, 19 Sep 1980)
1	5:31491	*See* SAND-80-0232C
CONF-800931-		(55. Society of Petroleum Engineers of AIME annual technical conference and exhibition, Dallas, TX, USA, 21-24 Sep 1980)
1	5:31597	*See* UCRL-84064
2	5:32146	*See* LA-UR-80-2103
3	5:32119	*See* LA-UR-80-2086
CONF-800932-		(2. joint Grenoble-Varenna international symposium on heating in toroidal plasmas, Como, Italy, 3-12 Sep 1980)
1	5:33113	*See* BNL-28076
CONF-800934-		(International environment and safety conference, London, UK, 1-4 Sep 1980)
1	5:32686	*See* UCRL-84036
CONF-800937-		(International symposium on medical radionuclide imaging, Heidelburg, F.R. Germany, 1-5 Sep 1980)
1	5:32838	*See* UCLA-12-1259
CONF-800941-		(19. DOD explosives safety seminar, Los Angeles, CA, USA, 9-11 Sep 1980)
1	5:32756	*See* SAND-80-1839C

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CONF-801005-		(International conference on circuits and computers, Port Chester, NY, USA, 1-3 Oct 1980)
2	5:32705	*See* UCRL-84640
CONF-801010-		(12. National Society for the Advancement of Materials and Process Engineering technical conference, Seattle, WA, USA, 7-9 Oct 1980)
3	5:32601	*See* SAND-80-0104C
CONF-801102-		(ASME winter annual meeting, Chicago, IL, USA, 16-21 Nov 1980)
19	5:31789	*See* DOE/ET/20279-97
COO-		
1340-69	5:32434	NTIS, PC A06/MF A01
1599-173	5:32777	NTIS, PC A04/MF A01
1599-174	5:32791	NTIS, PC A06/MF A01
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1599-177(Pt.4)	5:32792	NTIS, PC A06/MF A01
2218-154	5:33081	NTIS, PC A03/MF A01
2218-164	5:33082	NTIS, PC A02/MF A01
2704-22	5:31976	NTIS, PC A05/MF A01
2917-16	5:31833	NTIS, PC A07/MF A01
3071-244	5:32744	NTIS, PC A02/MF A01
3077-160	5:33157	NTIS, PC A02/MF A01
4057-4(Vol.1)	5:32221	NTIS, PC A06/MF A01
4057-11	5:32261	NTIS, PC A03/MF A01
4070-11	5:31834	NTIS, PC A06/MF A01
4266-1	5:32580	Princeton, NJ; Electrochemical Society, Inc. (1978).
4483-F	5:31977	NTIS, PC A09/MF A01
4512-1	5:32020	NTIS, PC A09/MF A01
4519-1	5:32021	NTIS, PC A06/MF A01
4631-11	5:33096	NTIS, PC A02/MF A01
4704-3	5:32058	NTIS, PC A08/MF A01
4705-34	5:31854	NTIS, PC A10/MF A01
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DHEW(NIOSH)-		
80-112	5:31788	NIOSH, Cincinnati, OH
DOE/AL/10891-		
T1	5:31978	NTIS, PC A11/MF A01
T1	5:31979	NTIS, PC A11/MF A01
T1	5:31980	NTIS, PC A11/MF A01
T1	5:31981	NTIS, PC A11/MF A01
T1	5:31982	NTIS, PC A11/MF A01
T1	5:31983	NTIS, PC A11/MF A01
T1	5:31984	NTIS, PC A11/MF A01
T1	5:31985	NTIS, PC A11/MF A01
T1	5:31986	NTIS, PC A11/MF A01
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11	5:31562	NTIS, PC A08/MF A01
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14	5:32782	NTIS, PC A05/MF A01
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79/4	5:31556	NTIS, PC A04/MF A01
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1	5:32335	NTIS (US Sales Only), PC A03/MF A01
8	5:32783	NTIS (US Sales Only), PC A03/MF A01
9	5:32784	NTIS (US Sales Only), PC A02/MF A01
14	5:32230	NTIS (US Sales Only), PC A02/MF A01
17	5:32231	NTIS (US Sales Only), PC A03/MF A01
DOE/CH/00134-		
1	5:31873	NTIS, PC A03/MF A01
DOE/CS-		
0159/2	5:32433	NTIS, PC A25/MF A01
DOE/CS/4431-		
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T2	5:32486	NTIS, PC E03/MF, $3.50
DOE/CS/05438-		
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1	5:32435	NTIS, PC A10/MF A01
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1	5:32044	NTIS, PC A17/MF A01
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1	5:31987	NTIS, PC A04/MF A01
DOE/CS/31072-		
T1	5:32149	NTIS, PC A02/MF A01
DOE/CS/34223-		
01	5:31988	NTIS, PC A04/MF A01
DOE/CS/35348-		
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2	5:33083	NTIS, PC A02/MF A01
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0008/1(79)	5:31452	NTIS, PC A04/MF A01
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0125-2Q79	5:31543	NTIS, PC A05/MF A01
0150(79)(80)	5:31607	NTIS, PC A09/MF A01
0171(78)	5:31768	NTIS, PC A08/MF A01
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0191(79)	5:32195	NTIS, PC A05/MF A01
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2	5:33037	NTIS, PC A03/MF A01
DOE/ER/10364-		
13	5:32944	NTIS, PC A03/MF A01
DOE/ER/10401-		
T1	5:32091	NTIS, PC A02/MF A01
DOE/ER/10449-		
1	5:32521	Amsterdam, NE; North-Holland Publishing Co. (1980).
1	5:32534	35 & 36: 159-170(1980)
1	5:32535	35 & 36: 213-218(1980)

Report No.	Abstract No.	Availability
1	5:32536	35 & 36: 243-248(1980)
1	5:32537	35 & 36: 285-290(1980)
1	5:32538	35 & 36: 531-536(1980)
1	5:32539	35 & 36: 543-548(1980)
1	5:32568	35 & 36: 61-66(1980)
1	5:32569	35 & 36: 273-277(1980)
1	5:32570	35 & 36: 279-284(1980)
1	5:32571	35 & 36: 381-386(1980)
1	5:32572	35 & 36: 387-390(1980)
1	5:32573	35 & 36: 459-462(1980)
1	5:32574	35 & 36: 605-610(1980)
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1	5:32422	NTIS, PC A16/MF A01
1	5:32423	NTIS, PC A16/MF A01
1	5:32425	NTIS, PC A16/MF A01
1	5:32426	NTIS, PC A16/MF A01
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8	5:31777	NTIS, PC A02/MF A01
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2740(OP)	5:32903	NTIS, PC A02/MF A01
2755(OP)	5:31711	NTIS, PC A02/MF A01
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80ASE129AT8	5:32515	*See* DOE/NASA/0032-80/7

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MTR-		
79W00087-01	5:32468	*See* PB-80-132251
79W00137	5:31535	*See* PB-297618
NASA-CR-		
159764	5:32187	*See* DOE/NASA/0030-80/6
159835	5:32518	*See* DOE/NASA/1024-1
159836	5:32516	*See* DOE/NASA/4396-4
159851	5:32515	*See* DOE/NASA/0032-80/7
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81464	5:32429	*See* DOE/NASA/1002-80-5
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0015	5:32418	NTIS
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24817	5:32324	*See* ORNL/SUB-7537/14
NP-		
24451	5:31771	NTIS (US Sales Only), PC A05/MF A01
24465	5:31589	Chicago, IL; Institute of Gas Technology (1979).
24976	5:31555	Columbus, OH; Department of Industrial Relations (1978).
24977	5:32503	NTIS (US Sales Only), PC A04/MF A01
24978	5:31617	NTIS (US Sales Only), PC A10/MF A01
24981	5:32372	NTIS (US Sales Only), PC A03/MF A01
24986	5:32471	Knoxville, TN; Tennessee Valley Authority (1977).
24987	5:32470	Washington, DC; Dept. of Transportation (1980).
24988	5:32469	Chattanooga, TN; Tennessee Valley Authority (1980).
24991	5:31774	$10.00
24993(Vol.1)	5:32499	Sacramento, CA; California Energy Commission (1980).
24993(Vol.2)	5:32498	Sacramento, CA; California Energy Commission (1980).
24998	5:32445	$10.00
25000	5:32496	NTIS, PC A03/MF A01
25001	5:32497	NTIS, PC A03/MF A01
25002	5:32455	NTIS (US Sales Only), PC A04/MF A01
25003	5:31828	Burlington, MA; Microwave Associates, Inc. (1980).
25004	5:31545	NTIS (US Sales Only), PC A05/MF A01
25006	5:32396	Palo Alto, CA; Electric Power Research Institute (1979).
25007	5:32381	NTIS, (US Sales Only), PC A03/MF A01
25008	5:32834	Washington, DC; National Science Foundation (1980).
25015	5:32018	Sacramento, CA; California Energy Commission (1980).
25019	5:32446	Sacramento, CA; California Energy Commission (1980).
25022	5:31569	Bloomington, IN; Geological Survey (1979).
25032	5:31560	Urbana, IL; Illinois State Geological Survey (1978).
25033	5:31559	Urbana, IL; Illinois State Geological Survey (1978).
25044	5:31849	Manhattan, KS; Kansas State Univ. (1980).
25046	5:31850	Salem, OR; Oregon State Department of Energy (1980).
25061	5:32477	Berkeley, CA; Giannini Foundation of Agriculture Economics (1978).
25062	5:31570	Bloomington, IN; Geological Survey (1978).
NRL-MR-		
4213	5:33116	NTIS, PC A04/MF A01
4309	5:33120	NTIS, PC A02/MF A01
NRL-Report-		
8416	5:33078	Naval Research Lab., Washington, DC
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196-16	5:31695	NTIS, PC A09/MF A01
1555-5	5:33121	NTIS, PC A04/MF A01
NYSERDA-		
79-7	5:31843	New York State Energy Research and Development Authority, Albany, NY
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7537/14	5:32324	NTIS, PC A10/MF A01
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7400	5:32118	NTIS, PC A02/MF A01
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2832-212	5:32835	NTIS, PC A03/MF A01
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2972-18	5:33046	*See* DOE/ER/02972-18
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102-79-003	5:32382	California Energy Commission, Sacramento
102-79-015	5:32407	California Energy Commission, Sacramento
102-80-005	5:32408	California Energy Commission, Sacramento
102-80-010	5:32394	California Energy Commission, Sacramento
104-79-005	5:32039	California Energy Commission, Sacramento
104-80-001	5:32004	California Energy Commission, Sacramento
140-80-002	5:32049	California Energy Commission, Sacramento
160-79-002	5:32399	California Energy Commission, Sacramento
300-79-005	5:32409	California Energy Commission, Sacramento
300-80-003	5:32203	California Energy Commission, Sacramento
300-80-004	5:32106	California Energy Commission, Sacramento, CA
300-80-006	5:32864	California Energy Commission, Sacramento
300-80-022	5:32189	California Energy Commission, Sacramento, CA
300-80-023	5:32410	California Energy Commission, Sacramento
300-80-025	5:31630	California Energy Commission, Sacramento
300-80-026	5:32367	California Energy Commission, Sacramento
300-80-027	5:32368	California Energy Commission, Sacramento, CA
400-00-017	5:32456	California Energy Commission, Sacramento, CA
400-80-001	5:32441	California Energy Commission, Sacramento
400-80-008	5:32442	California Energy Commission, Sacramento, CA

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400-80-062	5:32457	California Energy Commission, Sacramento
400-80-063	5:32462	California Energy Commission, Sacramento
500-78-039	5:31787	California Energy Commission, Sacramento
500-79-015	5:32040	California Energy Commission, Sacramento
500-80-14	5:32512	California Energy Commission, Sacramento
500-80-006	5:32395	California Energy Commission, Sacramento
500-80-007	5:32411	California Energy Commission, Sacramento
500-80-008	5:32416	California Energy Commission, Sacramento, CA
500-80-009	5:32152	California Energy Commission, Sacramento, CA
500-80-017	5:31844	California Energy Commission, Sacramento
500-80-018	5:32492	California Energy Commission, Sacramento, CA
500-80-024	5:32166	California Energy Commission, Sacramento
500-80-027	5:32493	California Energy Commission, Sacramento, CA
500-80-029	5:32465	California Energy Commission, Sacramento
800-79-004	5:32417	California Energy Commission, Sacramento
PATENTS-US-		(US: Commissioner of Patents, Washington, D.C. 20231, USA, $.50 per copy. Government Patent Applications available from NTIS)
A 034,229	5:32224	
A 055,209	5:32273	
A 064,592	5:32222	
A 077,821	5:32223	
A 078,758	5:32057	
A 085,551	5:32603	
A 090,845	5:32268	
A 092,154	5:32742	
A 096,261	5:32274	
A 098,451	5:32728	
4,163,689	5:32280	
4,164,849	5:32258	
4,169,190	5:32340	
4,170,692	5:32349	
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4,172,760	5:32272	
4,172,761	5:32279	
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4,192,714	5:32307	
4,197,461	5:32732	
4,197,462	5:32733	
4,201,692	5:32731	
PB-		
80-132251	5:32468	NTIS
296-708	5:31453	NTIS, PC A12/MF A01
297618	5:31535	NTIS, PC A17/MF A01
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90-80	5:32207	*See* TR-EE-8010
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3145	5:31680	NTIS, PC A05/MF A01
3179	5:31696	NTIS, PC A06/MF A01
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3253	5:31708	NTIS, PC A12/MF A01
3349	5:31697	NTIS, PC A04/MF A01
3405	5:31681	NTIS, PC A04/MF A01
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3425	5:31672	NTIS, PC A03/MF A01
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8080	5:32769	NTIS, PC A02/MF A01
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97	5:32786	NTIS, PC A02/MF A01
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1671/01-02F	5:31739	*See* NCEI-0018
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0034-76-1	5:31877	NTIS, PC A07/MF A01
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79-1666	5:32812	NTIS, PC A02/MF A01
79-1702	5:31712	NTIS, PC A05/MF A01
79-2006	5:32050	NTIS, PC A03/MF A01
79-2117	5:31701	NTIS, PC A03/MF A01
79-2154C	5:31867	NTIS, PC A02/MF A01
79-2156C	5:32345	NTIS, PC A02/MF A01
79-2163	5:32051	NTIS, PC A02/MF A01
79-2179	5:32325	NTIS, PC A04/MF A01
79-2240	5:31722	NTIS, PC A07/MF A01
79-2259	5:31864	NTIS, PC A04/MF A01
80-0078	5:32100	NTIS, PC A03/MF A01
80-0104C	5:32601	NTIS, PC A02/MF A01
80-0149	5:31702	NTIS, PC A04/MF A01
80-0232C	5:31491	NTIS, PC A02/MF A01
80-0298C	5:32593	NTIS, PC A02/MF A01
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80-0317C	5:32711	NTIS, PC A02/MF A01
80-0373C	5:32326	NTIS, PC A02/MF A01
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80-0531C	5:31705	NTIS, PC A02/MF A01
80-0637C	5:32730	NTIS, PC A02/MF A01
80-0686	5:32327	NTIS, PC A06/MF A01
80-0688	5:32270	NTIS, PC A05/MF A01
80-0769	5:32890	NTIS, PC A04/MF A01
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80-1234	5:32120	NTIS, PC A12/MF A01
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80-1351C	5:32121	NTIS, PC A02/MF A01
80-1358C	5:33122	NTIS, PC A03/MF A01
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80-1919C	5:31713	NTIS, PC A02/MF A01
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80-6011	5:32526	NTIS, PC A02/MF A01
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632-385	5:32026	NTIS, PC A03/MF A01
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0924-2	5:32007	NTIS, PC A02/MF A01
0924-3	5:32008	NTIS, PC A03/MF A01
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0924-9	5:32014	NTIS, PC A03/MF A01
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30	5:32081	NTIS, PC A15/MF A01
30	5:32082	NTIS, PC A15/MF A01
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80-17	5:32412	*See* PCTR-93-80
80-19	5:32413	*See* PCTR-94-80
8010	5:32207	Purdue Univ., West Lafayette, IN
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32512-6002-RU-00	5:32519	NTIS, PC A03/MF A01
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15644-80-1	5:32634	NTIS, PC A03/MF A01
17271-80	5:32949	NTIS, PC A03/MF A01
18490	5:33107	NTIS, PC A03/MF A01
18629	5:31669	NTIS, PC A02/MF A01
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18744	5:33065	NTIS, PC, $8.50
18748	5:31477	NTIS, PC A02/MF A01
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52931	5:32681	NTIS, PC A03/MF A01
52945	5:33038	NTIS, PC A09/MF A01
52965	5:32305	NTIS, PC A02/MF A01
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84640	5:32705	NTIS, PC A02/MF A01
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06-0049-79-2	5:32468	*See* PB-80-132251
USDA-REA-		
EIS(ADM)-		
73-10-F	5:32199	Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC (MF or HC) 79-0548
77-6-F	5:32823	Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 78-0818
78-2-F	5:32824	Information Resources Press, 2100 M Street, NW, Suite 316, Washington, DC. (MF or HC) Order No. 78-0936
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